LAB SUPPORT SERVICES
501300X

LORAIN

POWER EQUIPMENT

LORAIN® MODEL 200CBX

-48V POWER BOARD

Spec. No. 5821-052 Serial No. 275

INSTRUCTIONS

INSTALLATION

OPERATION

MAINTENANCE

RELIANCE COMM/TEC

LORAIN® MODEL 200CBX

-48V POWER BOARD

Spec. No. 5821-052 Serial No. 215

This Power Board includes equipment per Assembly Drawing J-5821-052 and is assembled per Outline Drawing _____ as follows:

Quantity	List	Equipment	
	1	50A	Common equipment, wiring and assembly for one -48V Power Board
	2	100A	
/	3	200A	
	4	300A	
/	5	Supplemental Relay Rack	
	6	Heat Baffle	
	7	RL50F50	Rectifier, 60 Hz
/	8	RL100F50	
	9	RHM200D50	
	10	RL50F50	Rectifier, 50-60 Hz
	11	RL100F50	
	12	RHM200C50	
/	13	WAA501B	Inverter E/W #1 Transfer Circuit
	14	WAA102B	
	15	WAA202B	

LORAIN PRODUCTS
Division of Reliance Electric Co.

WARRANTY

Seller warrants that the products it manufactures or sells shall be free from defects in material and workmanship during the first 90 days after the product is activated. During said period, Seller will repair or replace any defective parts free of charge to Buyer, including any labor costs. In addition, Seller shall repair or replace any defective parts, so discovered by Buyer to be defective within two years from the date of shipment of same, provided Buyer promptly so notifies Seller. In no case shall Seller's liability under this warranty extend beyond two years from the date of shipment of said product. This warranty shall not apply to any products which are misused, modified, repaired, or otherwise abused by Buyer or others. The repair or replacement of defective parts, or the refund of the invoice cost thereof, as shall be determined by Seller in its sole discretion, shall be the limit of Seller's liability hereunder and shall be Buyer's sole and exclusive remedy.

Handling or service charges in connection with the return of such products, if approved by Seller, shall be charged as determined by Seller. Seller shall not be liable in any event for any general or special, incidental or consequential damages to Buyer in excess of the amount of the purchase price of the products.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES. SELLER MAKES NO WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE WITH RESPECT TO ANY PRODUCTS EXCEPT AS HEREIN EXPRESSLY PROVIDED.

SYSTEMS AND EQUIPMENT NOT ECONOMICALLY RETURNABLE TO THE FACTORY

In the event that the product involved is a system or equipment which, in the judgement of Lorain Products, is not economically returnable to the factory or if Lorain Products has performed the installation, supervised the installation, or performed testing and turn-on, circuit components and Lorain repair labor are covered by this warranty for the first 90 days from date of turn-on and circuit components are warranted for two years from the date of shipment. Upon request, Lorain will send a service technician to the site to determine if the unit is defective in circuit components or workmanship, and will repair the equipment. If the failure is Lorain's fault, no invoice for circuit components or repair labor will be issued if the complaint has been issued within the first 90 days from date of turn-on. If the complaint is issued more than 90 days from the date of turn-on but within two years from date of shipment, the customer will be billed at the prevailing Customer Service rates but will not be billed for circuit components. If the problem occurs after two years from the date of shipment, circuit component and repair labor are billable.

If the problem has been created by misuse or abuse of the equipment or by malfunction of associated equipment or by environmental conditions, at any time after shipment, the customer will be billed for circuit component and labor.

GENERAL PROVISIONS

Lorain Products shall not be obligated to pay any costs or charges incurred by the customer or by any other party. In no event will Lorain Products be liable for consequential damages. No waiver, alteration or modification of any of the provisions herein shall be binding on Lorain Products unless in writing and signed by an authorized official of Lorain Products. If, during any warranty period, the subject equipment has, in the opinion of Lorain Products, been modified or misrepaired, the warranty will be void unless the modifications or repairs have been made after consultation with Lorain Products and upon the recommendation of Lorain Products.

LORAIN® MODEL 200CBX -48 VDC POWER BOARD SPEC. NO. 5821-052

CONTENTS

		PAGE
1.	DESCRIPTION	1
	General	1
	DC Distribution	1
	Low Voltage Disconnect	1
	Automatic Equalize	1
	Audible/Visual Alarm	2
	External Office Alarms	2
2.	TEST APPARATUS	2
3.	INSTALLATION	2
	Mounting	2
	Electrical Connections	2
	External Office Alarm Connections	2
	Initial Startup and Checkout	3
4.	OPERATION	5
	General	5
	Automatic Equalize	5
	Audible/Visual Alarm	5
	Metering	6
	External Alarms	6
5.	ADJUSTMENTS	6
	Low Voltage Disconnect Circuit Card (A1)	6
	Automatic Equalize Circuit Card (A3)	6
6.	CIRCUIT DESCRIPTION	6
	Low Voltage Disconnect	6
	Fuse Alarm	7
	Audible/Visual Alarm	7
	Automatic Equalize	7

1. DESCRIPTION

General

1.01 The LORAIN® Model 200CBX is a -48 VDC power board having a maximum current capacity of 50, 100, 200, or 300 amperes. The 200CBX is designed to be used in conjunction with FLOTROL® Rectifiers, DependAC® Inverters, and a 24 cell, lead-acid type battery.

1.02 The 200CBX is equipped with a meter, control, and distribution panel. This panel contains an ammeter, rectifier reference fuses, control fuses, distribution fuses, low voltage disconnect, automatic equalize control, and alarm circuitry.

DC Distribution

1.03 DC distribution is provided through six 40-ampere fuses located on the meter, control, and distribution panel. A seventh fuse is also supplied to allow fusing of the input to a DependAC inverter.

Low Voltage Disconnect

1.04 The low voltage disconnect circuit is a battery protection circuit designed to disconnect the loads from the battery and rectifier(s) in the event that the output voltage decreases below 42.0V, as in during an AC power failure. Once the battery voltage reaches 49.0V, the low voltage disconnect circuit will reconnect the loads to the battery and rectifier(s).

Automatic Equalize

1.05 The automatic equalize control circuit provides an automatic control, as well as manual control of the equalize charge mode for FLOTROL Rectifiers equipped with remote equalize terminals. When the current

delivering ability of the rectifier is lost and the battery voltage decreases below normal float voltage limits, a timing circuit of the equalize control assembly is activated. When the rectifier becomes operational again and can supply current, the automatic equalize control assembly will have the rectifier deliver an equalize voltage for approximately three, six, or nine times the duration that the timing circuit of the equalize control assembly was activated. This assembly also provides a rectifier fail alarm circuit, which is activated in the event of a failure in any rectifier associated with the power board or loss of the automatic equalize control fuse.

Audible/Visual Alarm

1.06 The audible/visual alarm circuit supplies an audible tone alarm in conjunction with a visual indicator in the event of abnormal operating conditions: blown rectifier reference fuse, blown control fuse, blown distribution fuse, failed rectifier or a failed inverter. The audible portion of the alarm can be disabled after an alarm condition has occurred. A visual indicator will illuminate to indicate when the audible alarm has been disabled.

External Office Alarms

1.07 A common alarm termination terminal block, located on the meter, control, and distribution panel, is supplied for connecting external office alarms to extended open and closed contacts of the inverter fail, rectifier fail, and fuse fail alarm circuits.

2. TEST APPARATUS

2.01 The test equipment listed below is sufficient to perform any test or adjustment procedure detailed in this instruction manual:

Description	Model
Variable DC supply, 35-60 VDC, capable of one ampere	
Multimeter	Triplett Model 630A, or equivalent
Insulated Screwdriver	GC Electronics Type 8728A, or equivalent

3. INSTALLATION

Mounting

3.01 The 200CBX Power Board is mounted in a 7' by 24" relay rack.

Electrical Connections

3.02 All inter-panel electrical connections have been made at the factory. The installer is to make all other connections as required; these are shown on the power board wiring diagram, T-5821-052.

External Office Alarm Connections

3.03 Extended relay contacts are available at TB1 on the meter, control, and distribution panel. The alarm connections are to be made in accordance with office requirements. The alarm wiring is shown on the power board wiring diagram, T-5821-052.

a) Inverter Fail Alarm: An inverter fail alarm is indicated by a closed circuit between terminals 2 and 3, and an open circuit between terminals 1 and 2 of TB1.

b) Rectifier Fail Alarm: A rectifier fail alarm is indicated by a closed circuit between terminals 4 and 5, and an open circuit between terminals 5 and 6 of TB1.

c) Fuse Fail Alarm: A fuse fail alarm is indicated by a closed circuit between terminals 7 and 8, and an open circuit between terminals 8 and 9 of TB1.

Initial Startup and Checkout

3.04 After all electrical connections have been made and checked, the power board can be put into operation by turning on the AC input circuit breaker on each rectifier, and the DC input circuit breaker on the inverter supplied with the power board.

3.05 The rectifier and inverter portion of the power board is factory adjusted and readjustment is not normally required. Should readjustment become necessary, refer to the separate rectifier and inverter instruction manuals supplied.

3.06 Meter Check: The power board is equipped with an ammeter. A visual check of this meter while the power board is operating is recommended to assure that the meter is working properly.

3.07 Low Voltage Disconnect: Perform the following procedure to check for proper operation of the low voltage disconnect circuit located on the meter, control, and distribution panel:

a) Remove control fuse B from the meter, control, and distribution panel.

b) Connect a variable DC power supply to pins C (negative) and S (positive) of A1 (4863-024).

WARNING

Input voltage polarity to the low voltage disconnect circuit is critical. Exercise caution that the correct polarity connections from the DC supply are made.

c) Adjust the power supply to 52 volts. Contactor K1 should be operated. Slowly adjust the power supply to below 42 volts. Contactor K1 should release at 42 volts. Slowly adjust the power supply to above 49 volts. Contactor K1 should operate at 49 volts. If the above limits are not satisfied, refer to Section 1946 for adjustment procedures.

d) Remove the power supply from A1. Replace control fuse B.

3.08 Automatic Equalize: The following test procedure will verify correct operation of the automatic equalize circuit located on the meter, control, and distribution panel:

a) Turn off the AC input circuit breaker on each rectifier.

b) Remove control fuse C from the meter, control, and distribution panel.

c) Connect a variable DC power supply to terminal block TB10 terminal 7 (negative) and terminal 1 (positive) of A3 (4843-826).

WARNING

Input voltage polarity to the automatic equalize circuit is critical. Exercise caution that the correct polarity connections from the DC supply are made.

d) Adjust the DC supply to 52 volts.

e) On the rectifier which is controlled by the automatic equalize circuit, set the float/equalize switch to the float position. The float and equalize voltage adjustment potentiometers should be set for normal output voltages. Operate the AC input circuit breaker of the rectifier to the ON position.

f) Momentarily operate the EQUALIZE switch on the power board to the RESET position. The equalize lamp on the rectifier should extinguish. Wait at least 30 seconds before proceeding with the next step.

g) Operate the AC input circuit breaker on the rectifier to the OFF position to simulate a rectifier failure. The RECT FAIL indicator on the power

board will illuminate. Slowly decrease the output voltage of the DC supply until the AUTO EQ indicator illuminates, indicating that the automatic equalize circuit is operating.

NOTE

The output voltage of the DC supply should be at least 2 volts below normal float voltage of the battery. If this range cannot be attained, refer to the adjustment procedure in paragraph 5.03.

h) The AC input power to the rectifier should be interrupted for a minimum of 30 seconds. After this time period has elapsed, operate the AC input circuit breaker of the rectifier to the ON position. The RECT FAIL indicator will extinguish. The AUTO EQ indicator will remain illuminated to indicate that the rectifier is operating in the equalize charge mode. The rectifier should deliver equalize voltage for a time period of approximately three, six, or nine times the duration that AC input power was interrupted.

i) After the equalize charge time has expired, the rectifier will return to the normal float mode of operation. This will be indicated by the AUTO EQ indicator extinguishing.

j) Remove the power supply connected to A3. Replace control fuse C.

3.09 Alarms: Perform the following procedure to check for the proper operation of the alarm circuits located on the meter, control, and distribution panel:

a) Fuse Fail: To check the fuse fail alarm circuits, remove a good alarm-type fuse located above any one of the distribution fuses and replace it with an open fuse. A circuit will close between terminals 7 and 8, and a circuit will open between terminals 8 and 9 of TB1. The FUSE FAIL indicator will illuminate and an audible alarm will activate, indicating a failure has occurred. Operate the audible/visual alarm switch momentarily to the ALARM CUTOFF position. The audible portion of the alarm will cease, but the FUSE FAIL indicator will still be illuminated. Momentarily operate the audible/visual alarm switch to the MANUAL RESET position. The audible portion of the alarm will again be activated. Replace the open fuse with a good fuse. A circuit will open between terminals 7 and 8, and a circuit will close between terminals 8 and 9 of TB1. The FUSE FAIL indicator will extinguish, and the audible alarm will cease.

b) Inverter Fail: To check the inverter fail alarm circuit when an inverter is supplied with the power board, manually turn off the DC input circuit breaker of the inverter. A circuit will close between terminals 2 and 3, and a circuit will open between terminals 1 and 2 of TB1. The INVR FAIL indicator will illuminate and an audible alarm will activate, indicating a failure has occurred. Operate the audible/visual alarm switch momentarily to the ALARM CUTOFF position. The audible portion of the alarm will cease, but the INVR FAIL indicator will still be illuminated. Momentarily operate the audible/visual alarm switch to the MANUAL RESET position. The audible portion of the alarm will again be activated. Restart the inverter by placing the DC input circuit breaker to the ON position. A circuit will open between terminals 2 and 3, and a circuit will close between terminals 1 and 2 of TB1. The INVR FAIL indicator will extinguish, and the audible alarm will cease.

c) Rectifier Fail: To check the rectifier fail alarm circuit when a rectifier is supplied with the power board, manually turn off the AC input circuit breaker on the rectifier. A circuit will close between terminals 4 and 5, and a circuit will open between terminals 5 and 6 of TB1. The RECT FAIL indicator will illuminate and an aud-

ible alarm will activate, indicating a failure has occurred. Operate the audible/visual alarm switch momentarily to the ALARM CUTOFF position. The audible portion of the alarm will cease, but the RECT FAIL indicator will still be illuminated. Momentarily operate the audible/visual alarm switch to the MANUAL RESET position. The audible portion of the alarm will again be activated. Restart the rectifier by placing the AC input circuit breaker to the ON position. A circuit will open between terminals 4 and 5, and a circuit will close between terminals 5 and 6 of TB1. The RECT FAIL indicator will extinguish, and the audible alarm will cease.

4. OPERATION

General

4.01 The 200CBX power board functions as a distribution center for -48 VDC power. DC power from the battery and rectifier(s) is applied to the power board where it is distributed to various DC loads. Provisions are also made to supply DC power to an inverter associated with the power board.

NOTE

All controls and indicators of this power board are located on the meter, control, and distribution panel.

Automatic Equalize

4.02 When the EQUALIZE switch is in the AUTO position, the rectifier(s) is automatically transferred to the equalize mode of charging when necessary. The AUTO EQ indicator will illuminate when this occurs. After the equalize charge time has expired, the rectifier(s) will automatically be returned to the normal float mode of operation and the AUTO EQ indicator will extinguish. To return the rectifier(s) to the float mode of operation before the equalize charge time has elapsed, momentarily place the EQUALIZE switch in the RESET position. Placing the EQUALIZE switch in the MAN position will provide manual control of the equalize charge mode of operation and cause the MAN EQ indicator to illuminate. The RECT FAIL indicator will illuminate in the event of a failure in any rectifier associated with the power board or a failed equalize control fuse.

4.03 The automatic equalize control circuit can provide equalize charging for three, six, or nine times the duration that power from the rectifier(s) was interrupted and battery voltage was below the normal float voltage limits. This time selection is accomplished by operating the rockers on the DIP switch (S2) located on the 4843-826 printed circuit card. Refer to SD4843-826 for the DIP switch combinations required for selecting the equalize charge time desired. The automatic equalize control circuit permits a maximum equalize charge time of approximately 300 hours when set for the X3, 300 hours when set for the X6, and 270 hours when set for the X9 period of equalize charge time.

Audible/Visual Alarm

4.04 The audible/visual alarm circuit supplies an audible tone in conjunction with a visual alarm indicator when the audible/visual alarm switch is in the NOR position and an alarm condition occurs. There are three visual alarm indicators associated with this circuit:

a) The INVR FAIL indicator illuminates in the event of a failure in an inverter associated with the power board.

b) The FUSE FAIL indicator illuminates in the event of a blown rectifier reference fuse, blown control fuse, or a blown distribution fuse.

c) The RECT FAIL indicator illuminates in the event of a failure in a rectifier associated with the power board.

4.05 When an alarm condition occurs, the audible portion of the alarm circuit can be disabled by momentarily placing the audible/visual alarm switch in the ALARM CUTOFF position. This causes the ACO GD indicator to illuminate. The visual alarm indicator will remain illuminated as long as the alarm condition is present. To enable the

audible portion of the alarm assembly once it has been disabled and while an alarm condition still exists, momentarily place the audible/visual alarm switch in the MANUAL RESET position. This causes the ACO GD indicator to extinguish. When the alarm condition is corrected, the visual alarm will extinguish and the audible alarm will cease.

Metering

4.06 An ammeter is provided to indicate the total load current of the power board.

External Alarms

4.07 This power board provides terminals for connection of external inverter fail, rectifier fail, and fuse fail alarm circuits. Refer to paragraph 3.03 for identification of these terminals.

5. ADJUSTMENTS

5.01 The rectifier and inverter portion of the power board is factory adjusted and readjustment is not normally required. Should readjustment become necessary, refer to the separate rectifier and inverter instruction manuals supplied.

Low Voltage Disconnect Circuit Card (A1)

5.02 The low voltage disconnect adjustments have been factory set to the limits indicated on the schematic diagram. Should readjustment become necessary, refer to Section 1946.

Automatic Equalize Circuit Card (A3)

5.03 Potentiometer R24 on circuit card 4843-826 (A3), located on the meter, control, and distribution panel, is factory set to initiate equalize charge operation of the controlled rectifier(s) when battery voltage decreases to 50.0 volts. It is recommended that no change be made to this adjustment setting; however, in the event readjustment becomes necessary, proceed as follows:

a) Turn off the AC input circuit breaker on each controlled rectifier.

b) Remove control fuse C from the meter, control, and distribution panel.

c) Connect a variable DC power supply to terminal block TB10 terminal 7 (negative) and terminal 1 (positive).

WARNING

Input voltage polarity to the automatic equalize circuit is critical. Exercise extreme caution that the correct polarity connection from the DC power supply are made.

d) Adjust the DC power supply to a level 2 volts below normal battery float voltage.

e) Connect the test probes of a multimeter, set to indicate DC voltage, to test point TP1 (+) and terminal 3 (-) of TB8 on A3.

f) Adjust potentiometer R24 counterclockwise until the voltage indicated on the multimeter decreases to zero volts. Adjust potentiometer R24 clockwise to increase the voltage indicated on the multimeter to a level of 11.78 to 13.02 volts DC.

g) Remove the multimeter test probes and the DC power supply. Replace control fuse C and return each rectifier to normal operation.

6. CIRCUIT DESCRIPTION

Low Voltage Disconnect

6.01 The low voltage disconnect circuit is comprised of a contactor and a voltage control relay circuit card A1 (4863-024) located on the meter, control, and distribution panel. During normal operation, the contactor is held energized through relay contacts of the voltage control relay (VCR) on plug-in printed circuit card A1. During a low voltage condition, the contactor is deenergized thus breaking the current path from the battery and rectifier(s) to the loads. Refer to Section 1946 for more details on the operation of the voltage control relay circuit card A1.

Fuse Alarm

6.02 Any open fuse of this power board causes a parallel connected alarm-type fuse to open and supply resistive battery to operate the fuse alarm relay K2. Relay K2 provides open and closed contacts for external fuse fail alarms.

Audible/Visual Alarm

6.03 The audible/visual alarm circuit is comprised of circuit card A2 (4861-030). Negative 48V input battery is provided at J1-10. Negative battery is provided through R6 at J1-9 to one side of an audible alarm. The other side of the audible alarm is connected to J1-11. When an alarm condition occurs, ground is supplied at either J1-1 (when a rectifier fail alarm occurs), J1-2 (when a fuse alarm occurs), or at J1-4 (when an inverter alarm occurs). This causes an associate light emitting diode (LED) to illuminate and also provides ground at J1-11 to activate the audible alarm. Momentarily placing S1 in the ALARM CUTOFF position will energize relay K1. Ground will be removed from J1-11 through relay contacts of K1 , disabling the audible alarm. Ground will be supplied through relay contacts of K1 to illuminate the ACO GD LED, DS5. Ground will also be supplied through relay contacts of K1 to sustain K1 in the energized position after S1 is released. Momentarily placing S1 in the MANUAL RESET position will cause relay K1 to drop out. Ground will be again supplied to J1-11 through relay contacts of K1, activating the audible alarm. Ground will be removed through relay contacts of K1, to extinguish the ACO GD LED, DS5. When the alarm condition is corrected, ground will be removed from either J1-1, J1-2 or J1-4, extinguishing the associated LED. Relay K1 will deenergize regardless of its previous state in order to ready the circuit for the next alarm condition.

Automatic Equalize

6.04 The automatic equalize circuit is comprised of circuit card A3 (4843-826). Negative 48 volt battery is applied to TB10 terminal 7, and ground is applied to TB10 terminal 1. When battery voltage is below the float voltage limit, adjustable with R24, and the rectifier is not delivering current, a set current is sent through M1 by action of the transmission gates, A3, turning off Q1 and turning on Q2 and Q3. Transistor Q3, conducting, illuminates the AUTO EQ LED and operates relay K1 and K2. These relays provide type C sets of contacts to operate the remote equalize feature of up to eight rectifiers.

6.05 When the rectifier resumes current delivering ability, the circuit will send a current of opposite polarity through M1 resulting in Q3 remaining on for a period of time selected by switch S2 to give 3, 6, or 9 times the duration that the battery was below float level and the rectifier was off. After the equalize time has expired, the circuit will return to normal causing the AUTO EQ LED to extinguish and relay K1 and K2 to drop out. At this point, the rectifier will return to the float mode of operation.

6.06 Momentarily placing S1 in the RESET position causes the rectifier to return to the float mode of operation before the equalize time has expired. When the circuit is reset, it must stay in the normal mode for approximately two minutes to allow internal circuitry to reset itself before another alarm is turned in.

6.07 An internal timer, also set by S2, will terminate the off timing cycle after 100 hours for an X3 period, 50 hours for an X6 period, and 30 hours for an X9 period, which allows a maximum equalize time of approximately 300 hours for an X3 period, 300 hours for an X6 period, and 270 hours for an X9 period.

6.08 When S1 is placed in the MAN position, the rectifier equalize charge mode is controlled manually. The MAN EQ LED will illuminate and relay K1 and K2 will operate. Relay contacts of K1 and K2 will operate the remote equalize feature of the rectifier until S1 is returned to the AUTO EQ position.

6.09 Failure of fuse F1 or presence of battery on terminal 1 of TB1 through TB8 will

illuminate the RECT FAIL LED and operate relay K3. Contacts of relay K3 provide 3 sets of C type contacts on terminal block TB9. One set is extended to TB1 of the meter, control, and distribution panel for connection to external alarms. A second set is used to activate the audible/visual alarm circuits.

LORAIN PRODUCTS

1122 F Street, Lorain, Ohio 44052
(216) 288-1122/TWX. 810-426-2130 (LORAIN PROD)/TLX. 98-0505 (LORN PROD LORN)

In Canada —
Reliance Telecommunication Products Ltd., 122 Edward St., St. Thomas, Ont.
TEL. 519-631-0780/TWX. 610-356-6703 (LORAIN PRODCAN)

In Mexico —
Productos Lorain de Mexico, S.A. de C.V., Apartado Postal 77001
TEL. 576-82-77/TLX./01774308 (1774308 LORME)

RELIANCE
COMM/TEC

INSTRUCTIONS

LORAIN® HIGH AND LOW VOLTAGE CONTROL RELAY ASSEMBLY

FOR USE IN 12, 24, 48, 60, or 130 VOLT DC POWER SYSTEMS

1. DESCRIPTION

1.01 The LORAIN® Voltage Control Relay (VCR) Assembly is designed to provide voltage control in 12, 24, 48, 60, or 130 volt DC power systems, depending upon the assembly furnished.

1.02 The energize and release values shown in Table 1 are normally furnished unless otherwise specified on original order or related application circuits.

1.03 The VCR relay contacts provide 2 independent open or closed loop circuits and 2 open or closed circuits with common armature contacts which can be connected as needed.

2. INSTALLATION

2.01 A printed circuit card socket is provided on the associated equipment panel which will accept the printed circuit card assembly. A one or 1-1/3 amp fused battery source should be provided for sensing lead of same polarity.

WARNING

The protection offered by fusing of transistorized equipment is limited; polarity must be observed or damage will result.

Electrical Connections

2.02 Installer connections, if necessary, are made at the printed circuit card socket or terminal block. Refer to the associated circuits for these connections.

Adjustment

2.03 Separate adjustments determine the low voltage and high voltage operating limits of the voltage relay. Follow the procedure outlined in paragraph 3.02 in making these adjustments.

3. ADJUSTMENT

General

3.01 Potentiometers R2 and R4 on the

Part Number	Input Voltage	Factory Setting	
		Release	Operate
4863-094	12V DC	11.8V	12.9V
4863-023	24V DC	23.4V	25.8V
4863-024	48V DC	47.5V	51.5V
4863-064	60V DC	58.5V	64.5V
4863-025	130V DC	126.0V	134.0V

TABLE 1

printed circuit card separately adjust the operating limits. In event the high or low voltage settings must be changed, the low voltage setting should be adjusted first as it sets the range of the high limit. A regulated variable DC test voltage source and an accurate DC voltmeter should be used to make these adjustments.

WARNING

Polarity of both DC supply voltage and test voltage connections to the voltage sensing circuit is critical; incorrect polarity will damage the voltage sensing assembly.

Procedure

3.02 Remove the supply fuse or disconnect the supply lead in order to remove regular DC input, and connect the variable test voltage source observing correct polarity to card socket pins C (negative) and S (positive).

3.03 Turn R2 fully counterclockwise and adjust the test voltage to the desired low limit. If relay K is not energized, turn R4 counterclockwise until relay K energizes. Slowly turn R4 clockwise until relay K releases. This sets the low limit.

3.04 Turn R2 fully clockwise. Set test voltage to desired high limit. Slowly turn R2 until relay K energizes. This sets the high limit.

4. CIRCUIT DESCRIPTION

General

4.01 Relay K, with a voltage detector circuit, make up the voltage control circuit. Relay K is normally energized and releases when the voltage being monitored decreases to a preset low limit. The relay will remain released until the monitored voltage increases to the preset high limit. Current to operate relay K is supplied by the voltage detector circuit.

Voltage Detector

4.02 A voltage sensing network compares the voltage being monitored with a constant voltage developed across a zener diode. The voltage sensing network is adjusted so that during a low voltage condition, the voltage developed is lower than the constant zener diode voltage. If the voltage being monitored should decrease to the low limit setting of potentiometer R4, the voltage detector circuit releases relay K. Once released, relay K will not energize until the voltage being monitored increases to the high limit setting of potentiometer R2.

LORAIN PRODUCTS

1122 F Street, Lorain, Ohio 44052
(216) 288-1122/TWX. 810-426-2130 (LORAIN PROD)/TLX. 98-0505 (LORN PROD LORN)

In Canada —
Reliance Telecommunication Products Ltd., 122 Edward St., St. Thomas, Ont.
TEL. 519-631-0780/TWX. 610-356-6703 (LORAIN PRODCAN)

In Mexico —
Productos Lorain de Mexico, S.A. de C.V., Apartado Postal 77001
TEL. 576-82-77/TLX./01774308 (1774308 LORME)

RELIANCE COMM/TEC

STOCK LIST

ITEM	NOTE	DESCRIPTION	PART NO.	LIST 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	SHOP NOTE
1		RELAY RACK, 7'-0" X 24"	4124-010	1	1	1	1	1																X
		METER, CONT & DIST PNL	4374-149	1	1	1	1																	X
5		BAFFLE, 8-1/4" X 23"	3777-617					1																
		AMMETER, 0-50A	2925-320	1																				
		,0-100A	2925-324		1																			
10		,0-200A	2925-328			1																		
		,0-300A	2925-330				1																	
		SHUNT, 50A	2982-710	1																				
15		,100A	2982-712		1																			
		,200A	2982-714			1																		
		,300A	2982-836				1																	
20		RECTIFIER, RL50F50	5431-028							1														
		,RL100F50	5431-019								1													
		,RHM200D50	5472-014									1												
		,RL50F50	5431-025										1											
C		,RL100F50	5432-009											1										
25		,RHM200C50	5475-010												1									
		INVERTER, WAA501B	5173-302													1								
		,WAA102B	3174-319														1							
30		,WAA202B	5175-306															1						
35		FUSE, 30A	2483-515													1								
		,40A	2483-519	6	6	6	6										1							
		,50A	2483-523															1						
		,60A	2483-525																1					
40		FUSE REDUCER	2488-705													1								
45		LUG, 6-4/0	2456-338	2	2																			
		,1/0-500MCM	2456-346			2	2																	
50		REAR COVER	4141-013	1	1	1	1																	
		NAMEPLATE	3184-701	1	1	1	1																	
55		BLANK PNL, 8-1/4" X 23"	3533-106													1								
60																								
65																								
70																								
73																								
80																								

MANUFACTURING NOTES

1. RECTIFIER DESIGNATIONS ARE TO BE 1/4" BLACK CHARACTERS. ALL OTHER STAMPING TO BE 5/16" UNLESS OTHERWISE SPECIFIED.
2. ASSEMBLE PER STANDARD EQUIPMENT ARRANGEMENTS UNLESS SPECIAL JOB PROFILE IS FURNISHED.

TABLE A

A EQUIPMENT (ENGINEERING INFORMATION)		B RATING	C LIST	D NO	E CIRCUIT & FIGURES EQUIPPED	SCHEMATIC INFORMATION F NUMBER	FIG	OPT
COMMON EQUIPMENT, WIRING AND ASSEMBLY FOR ONE -48V POWER BOARD	50A		1		T-5821-052 FIG 4	SD-5821-052	3, 8-12	
	100A		2					
	200A		3	1				
	300A		4					
SUPPLEMENTAL RELAY RACK			5					
HEAT BAFFLE			6					
RECTIFIER, 60HZ	RL50F50		7	1	T-5821-052 FIG 1	SD-5821-052	1	
	RL100F50		8					
	RHM200D50		9	1	T-5821-052 FIG 2	SD-5821-052	2	
RECTIFIER, 50-60HZ	RL50F50		10	1	T-5821-052 FIG 1	SD-5821-052	1	
	RL100F50		11					
	RHM200C50		12	1	T-5821-052 FIG 2	SD-5821-052	2	
INVERTER EQUIPPED WITH #1 TRANSFER CIRCUIT	WAA501B		13					
	WAA102B		14	1	T-5821-052 FIG 3	SD-5821-052	13	
	WAA202B		15					

TABLE B

ROLM SPECIFICATION NUMBER	CORRESPONDING LIST NUMBERS
V5CBXN500	L-1, 7 & 13
V5CBXR500	L-1,5, (2)7 & 13
V5CBXN1000	L-2,5,6 & 14
V5CBXR1000	L-2,5,6,(2)7 & 14
V5CBXN2000	L-2,5,8 & 15
V5CBXR2000	L-2,5,6,(2)8 & 15
1MCBXN500	L-2, 7 & 13
1MCBXR500	L-2,5, (2)7 & 13
1MCBXN1000	L-2,5,8 & 14
1MCBXR1000	L-2,5,6,(2)7 & 14
1MCBXN2000	L-2,5,8 & 15
1MCBXR2000	L-2,5,6,(2)8 & 15
2MCBXN500	L-2, 9 & 13
2MCBXR500	L-2,5, (2)9 & 13
2MCBXN1000	L-2,5,9 & 14
2MCBXR1000	L-2,5,6,(2)9 & 14
2MCBXN2000	L-2,5,9 & 15
2MCBXR2000	L-2,5,6,(2)9 & 15
3MCBXN500	L-3, 9 & 13
3MCBXR500	L-3,5, (2)9 & 13
3MCBXN1000	L-3,5,9 & 14
3MCBXR1000	L-3,5,6,(2)9 & 14
3MCBXN2000	L-3,5,9 & 15
3MCBXR2000	L-3,5,6,(2)9 & 15
4LCBXN500	L-3, 9 & 13
4LCBXR500	L-3,5, (2)9 & 13
4LCBXN1000	L-3,5,9 & 14
4LCBXR1000	L-3,5,6,(2)9 & 14
4LCBXN2000	L-3,5,9 & 15
4LCBXR2000	L-3,5,6,(2)9 & 15
5LCBXN500	L-3, 9 & 13
5LCBXR500	L-3,5, (2)9 & 13
5LCBXN1000	L-3,5,9 & 14
5LCBXR1000	L-3,5,6,(2)9 & 14
5LCBXN2000	L-4,5,9 & 15
5LCBXR2000	L-4,5,6,(2)9 & 15
6LCBXN500	L-4, 9 & 13
6LCBXR500	L-4,5, (2)9 & 13
6LCBXN1000	L-4,5,6,(2)9 & 14
6LCBXR1000	L-4,5,6,(2)9 & 14
6LCBXN2000	L-4,5,9 & 15
6LCBXR2000	L-4,5,6,(2)9 & 15

ENGINEERING NOTES

01. EQUIPMENT TO BE ORDERED BY SPECIFICATION AND LIST NUMBER PER TABLE B.
02. INVERTERS ARE EQUIPPED WITH TRANSFER #1 ACCESSORY.

REVISIONS			
1	3	1987	M

ITEM 37 PT NO CORRECTED. TABLE B, CORRESPONDING LIST NO'S UPDATED. NOTE 02 ADDED.
2 183 7844 [illegible] D A C.

1846736

POWER SYSTEMS

EQUIPMENT AND ASSEMBLY
50-300 AMP, -48 VOLT
POWER BOARD

MODEL 200CBX

LORAIN PRODUCTS CORPORATION
LORAIN, OHIO

DESIGN BY	E GARTON	DATE 2
DRAWN BY	E GARTON	DATE 4-19-85
CHECKED BY		DATE 4-27-85
APPROVED BY		DATE
APPROVED BY		DATE 6-27-85
RATING	STANDARD	

J-5821-052

SIZE D SHEET 1 OF 2

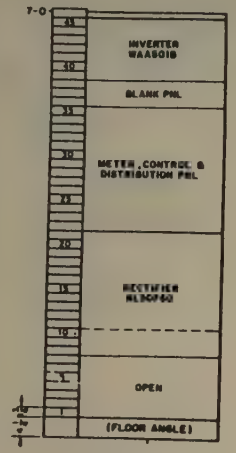


FIG 1
LIST 1 E/W 13 AND 7 OR 10

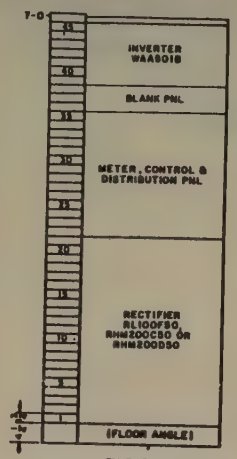


FIG 2
LIST 2, 3 OR 4 E/W 13 AND 8, 9, 11 OR 12

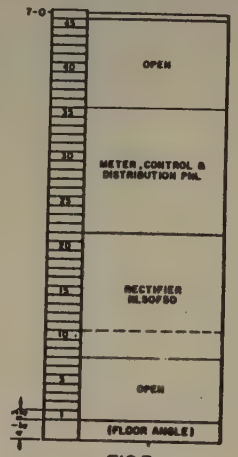


FIG 3
LIST 2 E/W 7 OR 10

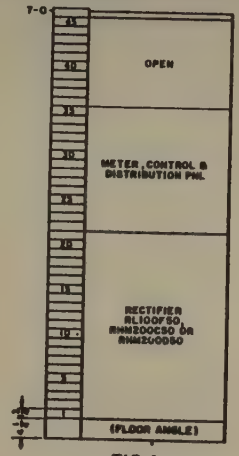


FIG 4
LIST 2, 3 OR 4 E/W 8, 9, 11 OR 12

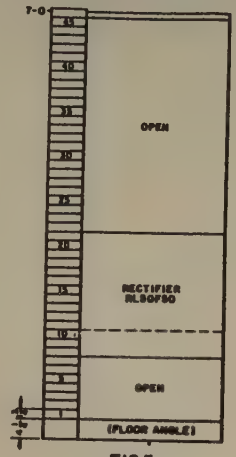


FIG 5
LIST 5 E/W 7 OR 10

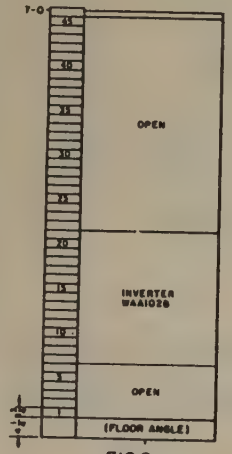


FIG 6
LIST 5 E/W 14

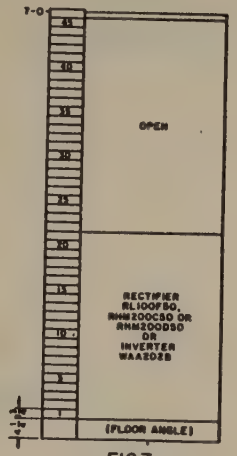


FIG 7
LIST 5 E/W 8, 9, 11, 12 OR 15

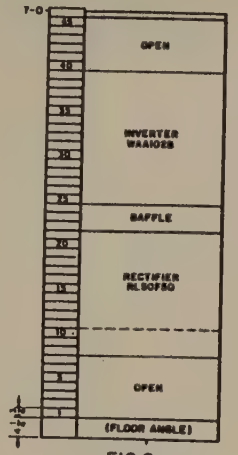


FIG 8
LIST 5 E/W 6, 14 AND 7 OR 10

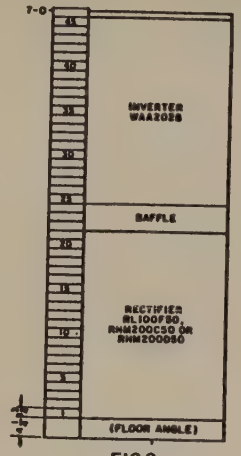


FIG 9
LIST 5 E/W 6, 15 AND 8, 9, 11 OR 12

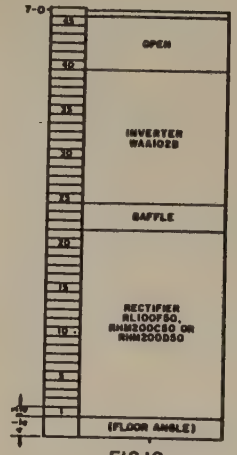


FIG 10
LIST 5 E/W 6, 14 AND 8, 9, 11 OR 12

MODEL 200CBX	J-5821-052
LORAIN PRODUCTS CORPORATION	SIZE D

SHEET 2 OF 2

PRINTED IN U.S.A.

SHEET INDEX

SHEET NO	CONTENTS
1	SHEET INDEX CIRCUIT NOTES SUPPORTING INFORMATION OPTION INDEX INFORMATION NOTES
2	FIG 1 RL TYPE RECTIFIERS FIG 2 RHM TYPE RECTIFIERS FIG 3 CHARGE LEADS FIG 4 -48V BATTERY FIG 5 LOW VOLTAGE DISCONNECT FIG 6 DISTRIBUTION FUSES FIG 7 RECTIFIER REFERENCE FUSES FIG 8 AUTOMATIC EQUALIZE
3	FIG 9 CONTROL FUSES FIG 10 ALARM TERMINATION FIG 11 FUSE ALARM RELAY FIG 12 AUDIBLE VISUAL ALARM FIG 13 INVERTER

CIRCUIT NOTES

101.

FEATURE OR OPTION		PROVIDE FIG	PROVIDE APP OR WRG	PROVIDE QUANTITY
-48V RECTIFIER	RL TYPE	1		AS REQD
	RHM TYPE	2		
-48V PLANT		3,9-12		ONE PER PLANT
INVERTER		13		AS REQD

102. REFER TO Y-5821-0C2 FOR CABLING INFORMATION AND WIRE CALCULATION.

103. INVERTER FAIL ALARM IS INDICATED BY A CLOSED CIRCUIT BETWEEN TERMINAL 2 AND 3 AND AN OPEN CIRCUIT BETWEEN TERMINAL 1 AND 2 OF TB1.

104. RECTIFIER FAIL ALARM IS INDICATED BY A CLOSED CIRCUIT BETWEEN TERMINAL 4 AND 5 AND AN OPEN CIRCUIT BETWEEN TERMINAL 5 AND 6 OF TB1.

105. FUSE FAIL ALARM IS INDICATED BY A CLOSED CIRCUIT BETWEEN TERMINAL 7 AND 8 AND AN OPEN CIRCUIT BETWEEN TERMINAL 8 AND 9 OF TB1.

106. THIS LEAD IS CONNECTED TO TB1 TERMINAL 8 FOR USE WITH MODEL RHM200050 SPEC NUMBER 9472-014; OTHERWISE CONNECT TO TB1 TERMINAL 7.

OPTION INDEX

APP OR WRG	LOCATION

SUPPORTING INFORMATION

CATEGORY	NO.
EQUIPMENT DRAWING	J-5821-052
WIRING DIAGRAM	P-5821-052 P-4394-148

INFORMATION NOTES

301. UNLESS OTHERWISE SPECIFIED, RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN MICROFARADS. FUSE VALUES ARE IN AMPERES.

302. LEAD AND EQUIPMENT DESIGNATIONS FOLLOWED BY A DASH (-) INDICATE CIRCUIT AND EQUIPMENT NUMBERING: 1 FOR 1ST (FIGURE, CKT OR EQPT), 2 FOR 2ND ETC.

303. ALL RELAYS ARE SHOWN RELEASED.

1846736			SCALE 1
POWER SYSTEMS	DRAWN BY R. HONEY	DATE 4-2-82	
	CHECKED BY	DATE 4-13-82	
CHARGE-DISCHARGE CIRCUIT 30-230 AMP, -48 VOLT	APPROVED BY	DATE	
	DESIGNED BY	DATE 9-29-82	
MODEL 200CBK	CUSTOMER STANDARD		
	SD-5821-052		
LORAIN PRODUCTS CORPORATION LORAIN, OHIO	DWG SIZE D	3 SHEETS	SHEET 1

LORAIN PRODUCTS (CANADA) LTD., ST THOMAS, ONTARIO

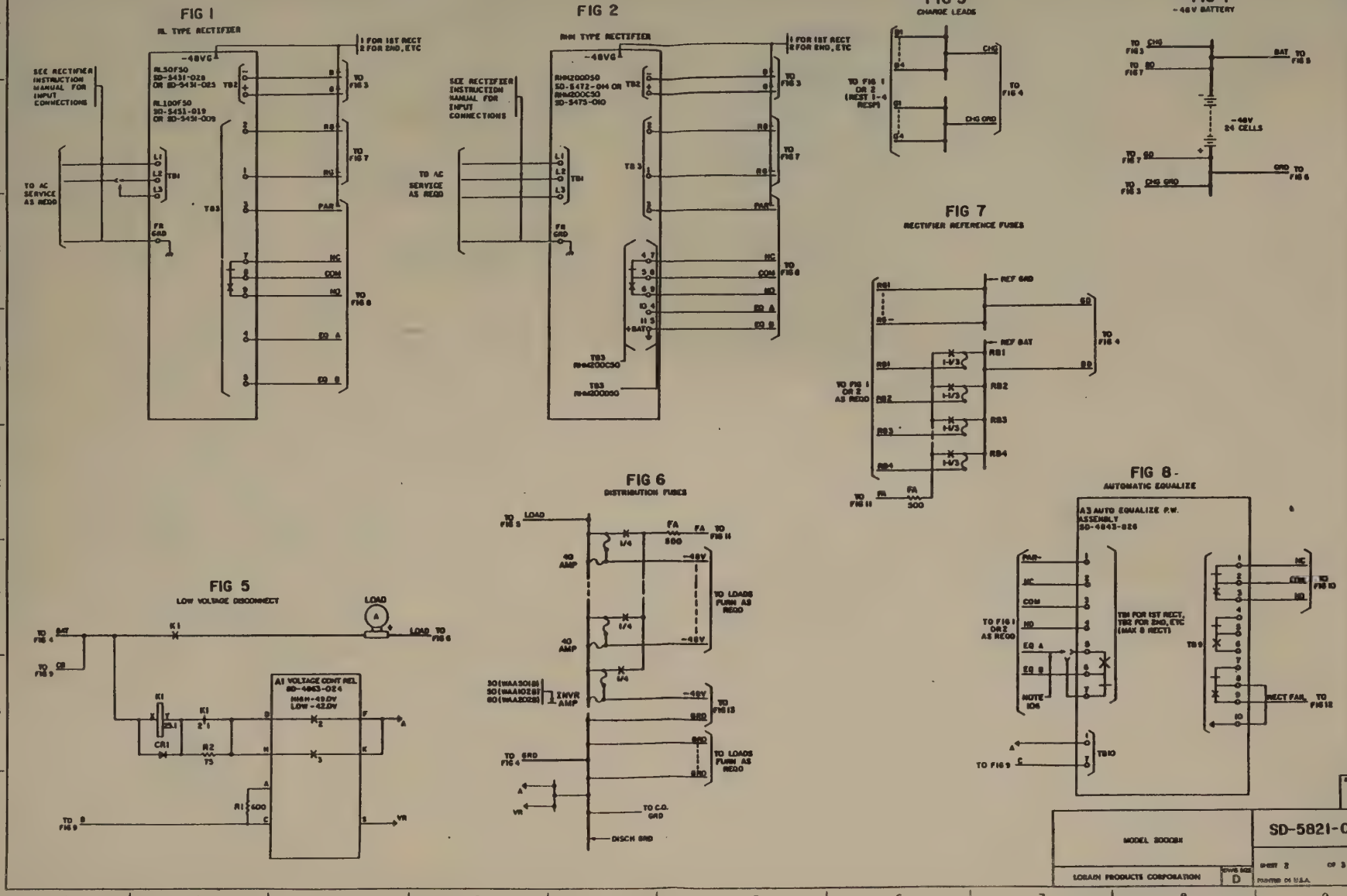


FIG 1
RL TYPE RECTIFIER
-48VG
1 FOR 1ST RECT
2 FOR 2ND, ETC
SEE RECTIFIER INSTRUCTION MANUAL FOR INPUT CONNECTIONS
RL50F50
SD-5431-028
OR SD-5434-025
RL100F50
SD-5431-019
OR SD-5434-009
TO AC SERVICE AS REQD
TB1
TB2
TB3
FA
GRD
TO FIG 3
TO FIG 7
TO FIG 8
RS
RV
PAR
NC
COM
NO
EQ A
EQ B
FIG 2
RHM TYPE RECTIFIER
-48VG
1 FOR 1ST RECT
2 FOR 2ND, ETC
SEE RECTIFIER INSTRUCTION MANUAL FOR INPUT CONNECTIONS
RHM200050
SD-5472-044 OR
RHM200C50
SD-5473-010
TO AC SERVICE AS REQD
TB1
TB2
TB3
RHM200C50
RHM200050
TO FIG 3
TO FIG 7
TO FIG 8
RS
RV
PAR
NC
COM
NO
EQ A
EQ B
+BAT
FIG 3
CHARGE LEADS
TO FIG 1 OR 2 (REST 1-4 RESP)
CHG
CHG GRD
TO FIG 4
FIG 4
-48V BATTERY
TO FIG 3
TO FIG 7
TO FIG 5
BAT
GRD
-48V 24 CELLS
CHG
CHG GRD
FIG 5
LOW VOLTAGE DISCONNECT
TO FIG 4
TO FIG 9
K1
LOAD
LOAD TO FIG 6
A1 VOLTAGE CONT REL
SD-4843-024
HIGH-49.0V
LOW-42.0V
CR1
R2
75
R1
500
TO FIG 9
VR
FIG 6
DISTRIBUTION FUSES
TO FIG 5
LOAD
FA
500
FA TO FIG 11
40 AMP
1/4
-48V
TO LOADS FURN AS REQD
30 (WAA30188)
50 (WAA10287)
60 (WAA30288)
EHVR AMP
GRD
TO FIG 4 GRD
TO C.O. GRD
DISCH GRD
FIG 7
RECTIFIER REFERENCE FUSES
REF GRD
REF BAT
TO FIG 4
TO FIG 1 OR 2 AS REQD
RB1
RB2
RB3
RB4
1-1/3
TO FIG 11
FA
500
FIG 8
AUTOMATIC EQUALIZE
A3 AUTO EQUALIZE P.W. ASSEMBLY
SD-4843-026
PAR-
NC
COM
NO
EQ A
EQ B
NOTE 106
TO FIG 1 OR 2 AS REQD
TBM FOR 1ST RECT, TB2 FOR 2ND, ETC (MAX 8 RECT)
TB9
TB10
TO FIG 10
RECT FAIL
TO FIG 12
TO FIG 9
MODEL 30008X
SD-5821-052
LORAIN PRODUCTS CORPORATION
SIZE D
SHEET 2 OF 3
PRINTED IN U.S.A.

FIG 9
CONTROL FUSES

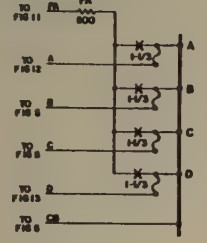


FIG 10
ALARM TERMINATION

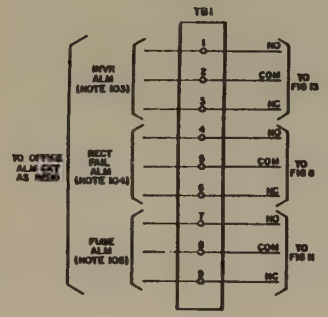


FIG 11
FUSE ALARM RELAY

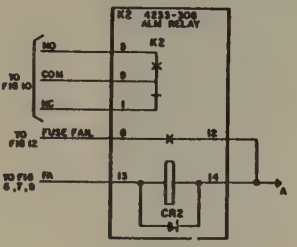


FIG 12
AUDIBLE VISUAL ALARM

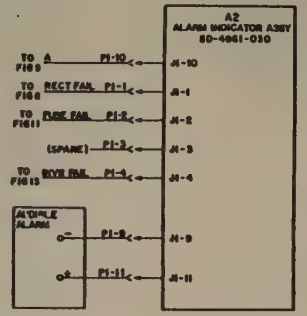
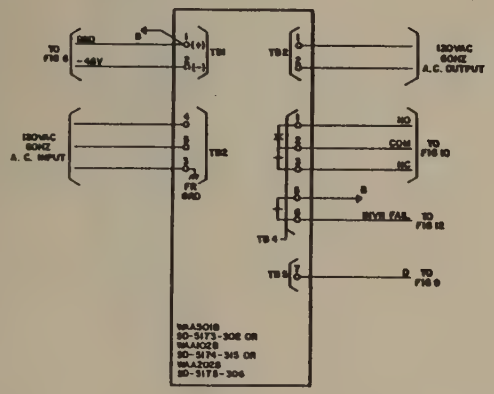


FIG 13
INVERTER



MODEL 800CBX	SD-5821-052
LORAIN PRODUCTS CORPORATION	DWG SIZE D

COMPONENT LIST

CAPACITOR

DESIG	CODE	
C1	(2737-133)	4.7 UF, 35 VDC, TANTALUM
(2) C2,8	(2737-134)	10UF, 20 VDC, TANTALUM
(2) C3,4	(2724-139)	0.001UF, 1000 VDC
C5	(2731-125)	47 UF, 50 VDC
C6	(2713-133)	0.1 UF
C7	(2713-116)	0.01 UF

DIODE

DESIG	CODE	
(14) CR1,4,5,6,7,8,9, 10,11,12,13	(2812-223)	
(2) CR2,3	(2835-325)	6.2V, 0.4W ZENER

LAMP

DESIG	CODE	
(2) DS1, DS2	(2810-134)	LED, YELLOW
DS3	(2810-124)	LED, RED

E CELL

DESIG	CODE	
M1	(2877-102)	MICRO-COULOMETER

FUSE

DESIG	CODE	
F1	(2486-102)	1/4A GMT

INTEGRATED CIRCUITS

DESIG	CODE	
A1	(2871-112)	NORTON AMPLIFIER
A2	(2876-302)	QUAD 2 INPUT NAND GATE
A5	(2876-601)	QUAD BI-LATERAL SWITCH
A4	(2876-308)	QUAD 2 INPUT NOR GATE
(2) A5,6	(2876-501)	14 STAGE RIPPLE-CARRY BINARY COUNTER
A7	(2871-001)	TIMER

RESISTOR

DESIG	CODE	
R20	(2634-670)	274K, 1/4 W
R36	(2634-690)	75K, 1/4 W
R2	(2634-693)	82.5K, 1/4 W ±1%
(2) R3,23	(2635-748)	392K, 1W ±1%
R4	(2634-714)	221K, 1/4W
R5	(2634-696)	100K, 1/4W
R6	(2634-688)	68.1K, 1/4W
R7	(2615-339)	1.5 MEGO, 1/2W
R8	(2634-681)	47.5K, 1/4W
(3) R9,15,17	(2615-327)	470K, 1/2W
(2) R10,14	(2615-335)	1MEGO, 1/2 W
R12	(2615-323)	330K, 1/2W
(2) R13,38	(2635-801)	2MEGO, 1W ±1%
R14	(2634-601)	1.21K, 1/4W ±1%
(2) R16,40	(2635-721)	121K, 1W
R18	(2615-351)	4.7 MEGO, 1/2W
R19	(2651-941)	1K, 5.5 W
R21	(2651-171)	390, 3W
(3) R22, 35,25	(2634-632)	4.75K, 1/4 W
R24	(2675-126)	50K, 1/2W POT
R34	(2634-648)	10K, 1/4 W
R26	(2651-330)	600, 3W
R27	(2651-337)	1.2K, 3W
R28	(2634-684)	36.2K, 1/4 W
(2) R29, 32	(2634-623)	3.32K, 1/4 W
R30	(2634-662)	18.2K, 1/4 W
R31	(2634-609)	1.02K, 1/4 W
R33	(2634-582)	475, 1/4 W
(2) R37,43	(2634-663)	22.1K, 1/4 W
R39	(2635-707)	1.21K, 1W
R41	(2635-761)	665K, 1W
R42	(2635-750)	422K, 1W

RELAY

DESIG	CODE	
(3) K1, 2, 3	(2543-428)	1200 OHM, 4C

SWITCH

DESIG	CODE	
S1	(2513-603)	DPDT
S2	(2513-566)	SW 8 POLE

TRANSISTOR

DESIG	CODE	
Q1	(2841-038)	
Q2	(2841-100)	
(2) Q3,4	(2841-038)	

CIRCUIT DESCRIPTION

THIS CIRCUIT IS INTENDED AS AN AUTOMATIC EQUALIZE CONTROL FOR LORAIN RECTIFIERS.

WHEN THE BATTERY VOLTAGE IS BELOW FLOAT (ADJUSTABLE LIMIT SET BY R24), AND THE RECTIFIERS ARE NOT DELIVERING CURRENT, A SET CURRENT IS SENT THROUGH M1 BY ACTION OF THE TRANSMISSION GATES TO TURNING OFF Q1 AND TURNING ON Q2 AND Q3. WHEN THE RECTIFIERS RESUME CURRENT DELIVERING ABILITY THE CIRCUIT WILL SEND A CURRENT OF OPPOSITE POLARITY THROUGH M1 RESULTING IN Q3 REMAINING ON FOR A PERIOD OF TIME SELECTED BY SWITCH S2 TO GIVE 3, 6, OR 9 TIMES THE DURATION THAT THE BATTERY WAS BELOW FLOAT AND THE RECTIFIERS WERE OFF. Q3 TURNED ON, ILLUMINATES THE YELLOW LED (AUTO EQ) AND OPERATES RELAY K1 AND K2. RELAY K1 AND K2 PROVIDE TYPE C SETS OF CONTACTS TO OPERATE THE REMOTE EQUALIZE FEATURE OF UP TO EIGHT RECTIFIERS. AFTER THE EQUALIZE TIME HAS EXPIRED THE CIRCUIT WILL RETURN TO NORMAL CAUSING THE RECTIFIERS TO RETURN TO THE FLOAT MODE.

TO RETURN THE RECTIFIERS TO THE FLOAT MODE BEFORE THE EQUALIZE TIME HAS ELAPSED THE S1 SWITCH CAN BE MOMENTARILY PLACED IN THE "RESET" POSITION. IF THE CIRCUIT IS RESET, IT MUST STAY IN THE NORMAL MODE (NO EQUALIZE ALARM) FOR 2 MINUTES TO ALLOW INTERNAL CIRCUITRY TO RESET ITSELF BEFORE ANOTHER ALARM IS TURNED IN. AN INTERNAL TIMER, ALSO SET BY S2 WILL TERMINATE THE OFF TIMING CYCLE AFTER 120 HR FOR A X3 PERIOD, SO HAS FOR A X6 PERIOD, AND 30 HRS FOR A X9 PERIOD. SWITCH ALLOWS A MAX EQUALIZE TIME OF APPROX 300 HR FOR A X3 PERIOD, 300 HRS FOR A X6 PERIOD AND 270 HRS FOR A X9 PERIOD.

FOR MANUAL CONTROL OF THE EQUALIZE CHARGE MODE THE S1 SWITCH CAN BE PLACED IN THE "MAN" POSITION. THE YELLOW LED (MAN EQ) WILL ILLUMINATE AND RELAY K1 AND K2 WILL OPERATE. THE RELAY CONTACTS WILL OPERATE THE REMOTE EQUALIZE FEATURE OF THE RECTIFIERS UNTIL THE SWITCH IS RETURNED TO THE (AUTO EQ) POSITION.

FAILURE OF FUSE F1 OR PRESENCE OF BATTERY ON TERM. 2 OF TB1 THRU TB8 (WHEN CONNECTED TO THE RECTIFIERS) WILL ILLUMINATE RED-LED (RECT FAIL/FA) AND OPERATE RELAY K3. CONTACTS OF RELAY K3 PROVIDE 1 SETS OF C TYPE CONTACTS ON THE TERM. STRIP TB9 FOR CONNECTION TO OFFICE ALARM CIRCUITS.

TERMINAL STRIP TB10 PROVIDES CONNECTIONS FOR NEG BATTERY INPUT (TERM. 7) AND POS GROUND INPUT (TERM. 1). NORMAL OPERATION IS FOR 48 VOLT. FOR 24 VOLT APPLICATIONS STRAPPING OPTIONS (A) MUST BE PROVIDED.

TIMING SET-UP

TIME MULTIPLIER	S2 POSITION (CL = CLOSED)							
	1	2	3	4	5	6	7	8
X3							CL	CL
X6				CL	CL			
X9	CL	CL						

NOTES.

1. UNLESS OTHERWISE SPECIFIED, RESISTANCE VALUES ARE IN OHMS AND CAPACITANCE VALUES ARE IN MICROFARADS. VALUES PRECEDED BY THE SYMBOL + (PLUS) OR - (MINUS) ARE IN VOLTS.
2. NORMAL OPERATION IS ON 48 VOLT BATTERY OPTION (A) IS FOR OPERATION ON 24 VOLT BATTERY
3. CODES WITHIN PARENTHESES AS (2737-132) REPRESENT LPC PART NUMBERS
4. FOR EXTENSION OF CIRCUIT BEYOND 8 RECTIFIERS SEE SD-4843-829 FOR ACCESSORY P.W. CARD CIRCUIT

MANUFACTURING REFERENCES

CATEGORY	NUMBER
ASSEMBLY DRAWING	4843-826
P.W. BOARD	3134-714
CONNECTOR ON FRAME	NONE

REVISIONS

2	1837488	3-9-81	R.M.

CIRCUIT REVISED FOR SELECTIVE TIMING.

3	1837638	10-1-81	R.L.

A2(2876-312), R20(2634-670), R35(2634-632) AND R36(2634-690) WERE 2876-301, 2634-696, 2634-648 AND 2634-681 RESP.

4	1837675	11-9-81	T.I.

(A) BYPASS CAPACITOR C8 ADDED

DESIGN			SIZE 4
DRAWN BY	F. GARTON	DATE	5-18-78
TRACED BY		DATE	
CHECKED BY		DATE	10-31-79
APPROVED BY	R. W. HOWALD	DATE	8-5-80
RATING			

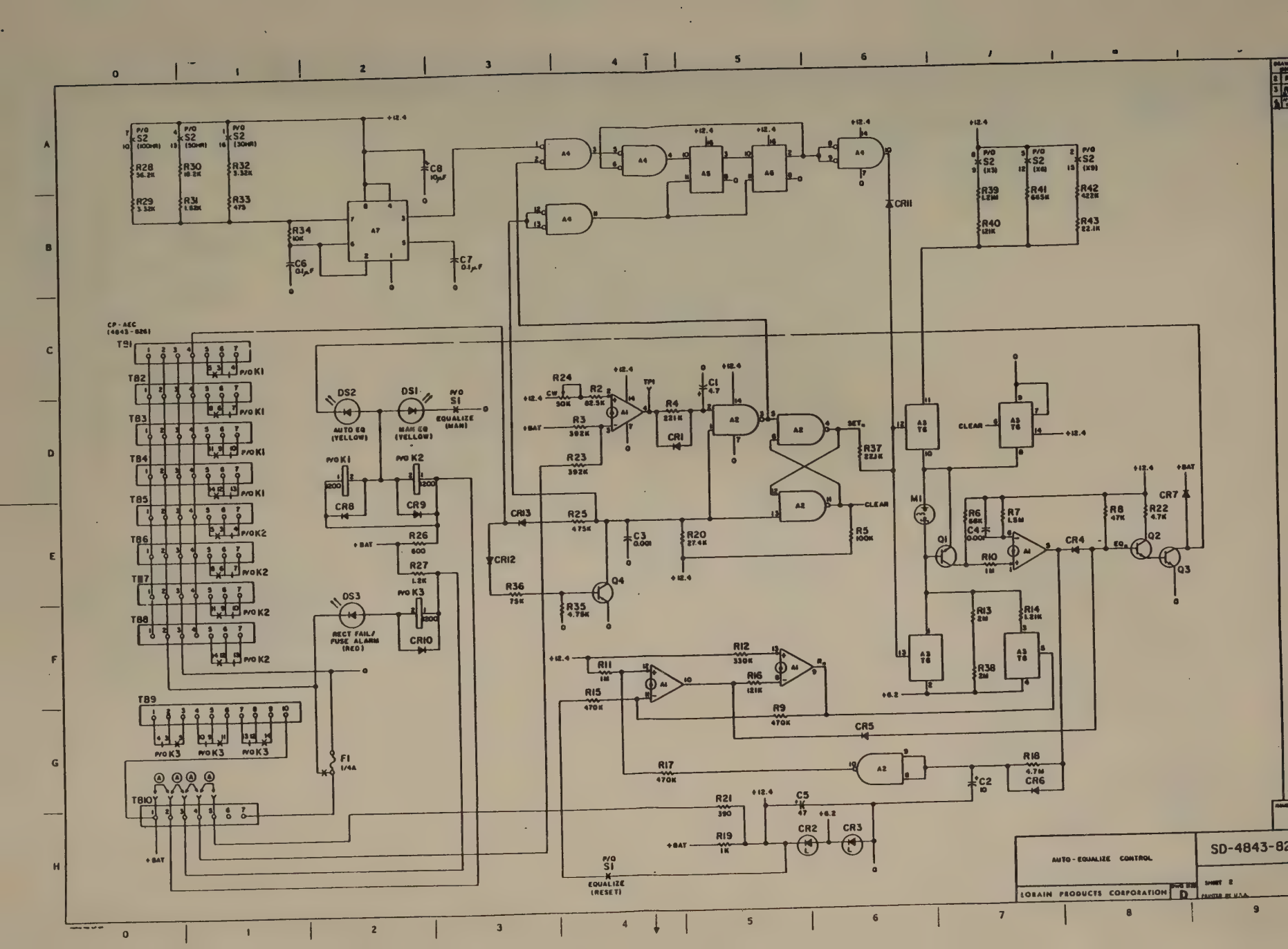
AUTO-EQUALIZE CONTROL

SD-4843-826

LORAIN PRODUCTS CORPORATION
LORAIN, OHIO

SIZE D

SHEET 1 OF 2


AUTO-EQUALIZE CONTROL
SD-4843-82
LORAIN PRODUCTS CORPORATION
SIZE D
SHEET 2
CP-AEC (4843-8261)
AUTO EQ (YELLOW)
MAN EQ (YELLOW)
EQUALIZE (MAN)
RECT FAIL/ FUSE ALARM (RED)
EQUALIZE (RESET)
CLEAR
SET
+12.4
+BAT
+6.2

MANUFACTURING REFERENCES	
CATEGORY	NUMBER
ASSEMBLY DRAWING	4861-030
P W. BOARD	3155-637
CONNECTOR ON FRAME	2478-558

1 NEW

COMPONENT LIST

DIODES

	DESIG	CODE
(5)	CR1-5	(2811-101) 1N4148
(6)	CR6-11	(2812-310) 1N4818

DIODES, LIGHT EMITTING

	DESIG	CODE
(4)	DS-4	(2818-121) RED
	DS5	(2818-131) YELLOW

RELAY

DESIG	CODE
K1	(2543-715) 24VDC, 590 OHMS

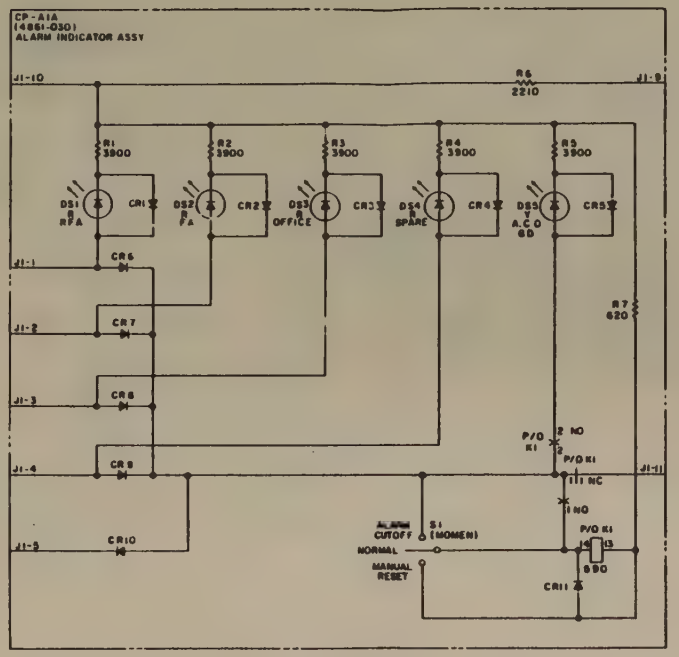
RESISTORS

	DESIG	CODE
(5)	R1-5	(2651-205) 3.9K, 3W
	R6	(2639-641) 2210 OHMS, 1W
	R7	(2651-180) 620 OHMS, 3W

SWITCH

DESIG	CODE
S1	(2513-6031) 1PDT

CP-A1A
(4861-030)
ALARM INDICATOR ASSY



SYMBOL
SHOWN IN DETAIL ON F S

CIRCUIT DESCRIPTION AND INPUT OUTPUT INFORMATION

A GROUND FED ALARM SIGNAL AT J1-1 THROUGH J1-4 WILL PRODUCE A GROUND AT J1-11 AND LIGHT AN ASSOCIATED LED. THE GROUND SIGNAL AT J1-11 MAY BE USED TO ACTUATE AN AUDIBLE ALARM.

IF IT IS DESIRED TO CUTOFF THE AUDIBLE ALARM, PLACING SWITCH S1 MOMENTARILY INTO THE ALARM CUTOFF POSITION WILL ENERGIZE RELAY K1 AND REMOVE GROUND FROM J1-11. AN ALARM CUTOFF GUARD LED WILL LIGHT. THE AUDIBLE ALARM MAY BE RECONNECTED BY PLACING S1 INTO THE MANUAL RESET POSITION.

WHEN THE ALARM GROUND IS REMOVED, THE K1 RELAY WILL BE DEENERGIZED REGARDLESS OF ITS PREVIOUS STATE AND THE CIRCUIT WILL BE READY FOR THE NEXT ALARM CONDITION.

DIODE CR10 IS PROVIDED TO EXTEND ANY OF THE GROUND ALARM SIGNALS AT J1-5.

NEGATIVE BATTERY FUSED AT 1/2 AMP IS REQUIRED AT J1-10. NEGATIVE SUPPLY VOLTAGE FOR AN AUDIBLE ALARM IS MADE AVAILABLE THROUGH R6 AT J1-9.

NOTES

UNLESS OTHERWISE SPECIFIED, RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN MICROFARADS. VALUES PRECEDED BY THE SYMBOL + (PLUS) OR - (MINUS) ARE IN VOLTS.

2 CODES IN PARENTHESES, AS (2811-101) REPRESENT L P C PART NUMBERS.

184-6390

SCHEMATIC DIAGRAM FOR ALARM INDICATOR ASSEMBLY

DESIGN	B BARNES	DATE 1
DRAWN BY	J TUTTLE	DATE 11-30-79
CHECKED BY		DATE
APPR	12-6-79	
CHECKED BY		DATE
APPROVED BY		DATE 2/29/80
RATING	STANDARD	

SD 4861-030

LORAIN PRODUCTS CORPORATION
LORAIN, OHIO

SIZE D

SHEET 1 OF 1

CPS—VCR
VOLTAGE CONTROL RELAY

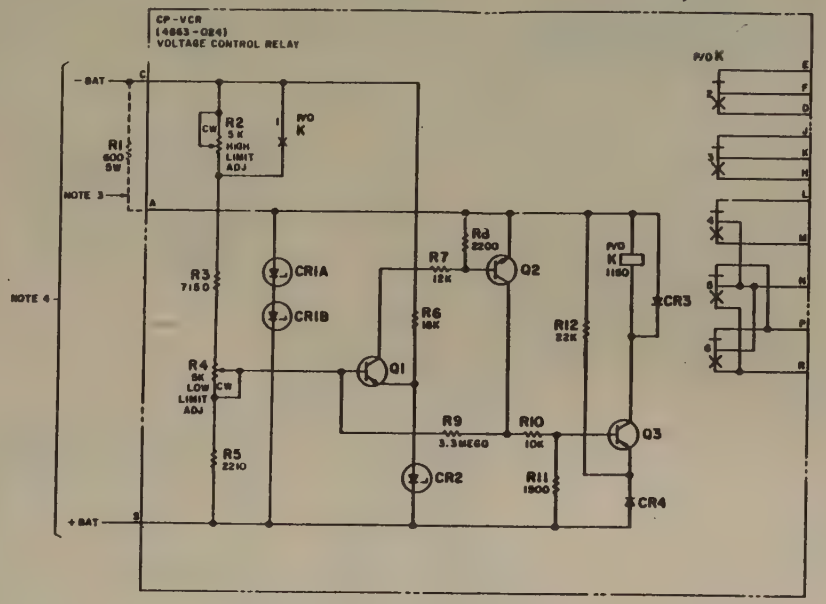
COMPONENT LIST

DIODE DESIG		CODE
(2)	CR1A,1B	(2636-212) 13V, 1W, ZENER
	CR2	(2835-481) 8.2V, 0.4W, ZENER
(2)	CR3, 4	(2812-310)

RELAY DESIG		EDM
	K	(2543-422)

RESISTOR DESIG		CODE
(2)	R2,4	(2633-076) 5K POTENTIOMETER
	R3	(2635-556) 715Ω OHM, 1W, 1%
	R5	(2635-641) 2210 OHM, 1W, 1%
	R6	(2615-293) 18K, 1/2W
	R7	(2615-288) 12K, 1/2W
	R8	(2615-271) 2200 OHM, 1/2W
	R9	(2615-347) 3.3 MEGΩ, 1/2W
	R10	(2615-287) 10K, 1/2W
	R11	(2615-267) 1500 OHM, 1/2W
	R12	(2615-295) 22K, 1/2W

TRANSISTOR DESIG		CODE
(2)	Q1, 3	(2843-151)
	Q2	(2841-155)



MANUFACTURING REFERENCES

CATEGORY	NUMBER
ASSEMBLY DRAWING	4863-024
P.W. BOARD	3187-113
CONNECTOR ON FRAME	3875-318 OR 4233-370

SYMBOL

SHOWN IN DETAIL IN FS

NOTES:

1. UNLESS OTHERWISE SPECIFIED, RESISTANCE VALUES ARE IN OHMS AND CAPACITANCE VALUES ARE IN MICROFARADS.
2. CODES WITHIN PARENTHESES AS (2636-212) REPRESENT LPC PART NUMBERS.
3. ITEMS SHOWN WITH DOTTED LINES ARE NOT SUPPLIED AS PART OF THIS ASSEMBLY.
4. PROVIDE 1-1/3 AMP FUSE IN EITHER —BAT. LEAD FOR POSITIVE GROUND SYSTEMS OR + BAT. LEAD FOR NEGATIVE GROUND SYSTEMS.
5. POLARIZING NOTCH ON B.

REVISIONS			
D	1833821 A 1	REDRAWN WAS SD-1866-02 ISS 4	30 74
6	183-6829	9 27 78	CR3 & CR4 WERE 2811-204, Q1 WAS 2847-098, Q2 WAS 2841-098, Q3 WAS 2847-100, R2 WAS 2633-072, & R3 WAS 2635-671.

VOLTAGE CONTROL RELAY
FOR 48 VOLT POWER BOARD
TWO LIMITS (OVERLAP)
CONTROL FUNCTION

DRAWN BY	DWG 5-25-65
CHECKED BY	D GURNACK 5-26-65
APPROVED BY	
APPROVED BY	G VASEK 5-28-65
DATA	STANDARD

SD-4863-024

LORAIN PRODUCTS CORPORATION
LORAIN OHIO

DWG SIZE D

SHEET 1 OF 1

TABLE A

SO-T DWG CROSS REFERENCE & FIGURE LOCATION TABLE

ITEMS IN PARENTHESES ARE FOR INFORMATION ONLY AND ARE NOT TO BE RECORDED ON JOB WIRING LIST DRAWING

LINE	SO-5821-052			T-5821-052				REMARKS
	SHEET	FIG	OPT	FIG	WRG	APP	SHEET	
1	2	1		1			2	
	2	2		2			2	
	2	13		3			2	
	2	4		4			2	
5	2,3	3,5-12		5			2	
10								
15								
20								
25								

TABLE B

RECORD OF FIGURES APPARATUS AND WIRING CHANGES

CHANGED ON ISSUE	IF OFFICE RECORDS		THIS OPTION WAS FURNISHED	SEE ENG NOTE	RATING			
	SPECIFY	DO NOT SPECIFY			STD	A&M	MD	SPL

TABLE D

CALCULATION OF VARIABLE LEAD SIZES

LEAD	LOOP DROP (VOLTS)	CALCULATE FOR
Ⓑ	1.0	MAX CHARGE CAPACITY OF PLANT
Ⓒ	1.0	RATED CHARGE CAPACITY OF RECTIFIER (NOTE 36)
Ⓓ	0.5	MAX DISCHARGE CAPACITY OF PLANT

TABLE E

FEATURE TABLE

ITEM	FEATURE	SPECIFY T-5821-052				SEE NOTE	REMARKS
		FIG	QUAN	WRG	APP		
1	RL TYPE RECTIFIER	1	AS REQD			36	
2	RHM TYPE RECTIFIER	2	AS REQD			36	
3	INVERTER	3	1				
4	-48V BATTERY	4					NOT PROVIDED FURN ON JOB BASIS
5	METER, CONTROL AND DISTRIBUTION	5	1				

BATTERY LEADS

CHARGE OR DISCHARGE CAPACITY OF PLANT, AMPERES	Ⓒ Ⓓ LEAD SIZE	MAX LOOP LENGTH BAT TO PWR BD	
		Ⓑ	Ⓓ
50	6	48'	24'
	4	75'	38'
	2		60'
	1/0		95'
75	4		25'
	2		40'
	1/0		64'
	2/0		80'
	3/0		100'
100	2	60'	30'
	1/0	95'	48'
	2/0		60'
	3/0		75'
	4/0		95'
150	1/0	64'	32'
	2/0	80'	40'
	3/0		50'
	4/0		64'
	250MCM		75'
	300MCM		90'
200	3/0	76'	38'
	4/0	96'	48'
	250MCM		56'
	300MCM		68'
	350MCM		78'
	400MCM		90'
230	4/0		41'
	250MCM		48'
	300MCM		59'
	350MCM		68'
	400MCM		78'
	500MCM		98'
300	350MCM	105'	
400	(2) 3/0	76'	
	(2) 4/0	95'	
	(2) 250MCM	112'	

ENGINEERING NOTES

S4 THIS DRAWING AGREES WITH ISSUE 1 2 — SO-5821-052 ISSUE 1 1

S2 EQUIPMENT ARRANGEMENT PER J-5821-052

S3 A C SERVICE EQUIPMENT NOT PROVIDED; FURN AS REQD

S4 DISTRIBUTION FUSES SHOWN ARE TYPICAL, QUANTITY AND CAPACITY SHALL BE FURN IN ACCORDANCE WITH JOB INFO

S5 INSTRUCT INSTALLER TO CONNECT ALARM STRAPPING AS REQD PER JOB CONDITION

S6 SEE ASSOCIATED POWER DATA SHEET OR 48 VOLT RECTIFIER DWG 0311-916 FOR REQD TERMINATIONS, WIRE AND FUSE SIZES FOR RECTIFIER MODEL BEING USED

MANUFACTURING NOTES

SHOP	INST	
X		1 COLORED LEADS NOT OTHERWISE SPECIFIED TO BE 20 GA
X		2 Bl - TERMINAL NEAREST PANEL
X	X	3 B - LEADS RUN BY INSTALLER
X		4 ∞ - LEADS INSULATED WITH SLEEVING
X	X	5 DO NOT CUT CALIBRATED SHUNT LEADS. FOLD UP EXCESS AND TIE TO WIRE HARNESS
X	X	6 LEADS SHOWN TERMINATED IN COMPONENTS WITHOUT TERMINALS ARE FURNISHED WITH COMPONENTS
X		7 D - WIRING NOT INCLUDED IN LOCAL WIRE HARNESS BUT RUN AS SEPARATE LEADS
X	X	8 A - LEADS RUN BY SHOP WHEN ASSOCIATED EQUIPMENT IS SHOP MOUNTED IN SAME BAY, OTHERWISE RUN BY INSTALLER
X	X	9 SEE J-5821-052 AND ASSOCIATED ASSEMBLY DRAWINGS FOR PART NUMBERS
X	X	10 TERMINAL ON CARD RECEPTACLE SHOWN SOLID DENOTES LOCATION OF POLARIZING KEY
X	X	11 CONNECT THIS LEAD TO TB1 TERMINAL 5 FOR USE WITH MODEL RHM2000S0 SPEC NUMBER 5472-014; OTHERWISE CONNECT TO TB1 TERMINAL 7.
X	X	12 INVERTER FAIL ALARM IS INDICATED BY A CLOSED CIRCUIT BETWEEN TERMINAL 2 AND 3 AND AN OPEN CIRCUIT BETWEEN TERMINAL 1 AND 2 OF TB1
X	X	13 RECTIFIER FAIL ALARM IS INDICATED BY A CLOSED CIRCUIT BETWEEN TERMINAL 4 AND 5 AND AN OPEN CIRCUIT BETWEEN TERMINAL 5 AND 6 OF TB1.
X	X	14 FUSE FAIL ALARM IS INDICATED BY A CLOSED CIRCUIT BETWEEN TERMINAL 7 AND 8 AND AND OPEN CIRCUIT BETWEEN TERMINAL 8 AND 9 OF TB1.
X		15 Ⓓ LEADS TO BE 6GA FOR WAA5018 AND 6GA FOR WAA1028 AND WAA2028.

1	BP	MAY 3	982
2	1837844		11-12-82 D.A.C.

AUTO EQUALIZE WIRING CORRECTED NOTE 56 ADDED BP MAY 1-1982

1846736

POWER SYSTEMS

CHARGE AND DISCHARGE CIRCUIT 50-300 AMP, -48 VOLT

MODEL 200CBX

DRAWN BY R. MONEY 4-14-82
CHECKED BY 4-27-82
APPROVED BY
APPROVED BY 4-29-82

RATING STANDARD

T-5821-052

LORAIN PRODUCTS CORPORATION
LORAIN, OHIO
LORAIN PRODUCTS (CANADA) LTD ST THOMAS, ONTARIO

DWG SIZE D

2 SHEETS

SHEET 1

PRINTED IN U.S.A.

FIG 1
RL TYPE RECTIFIER

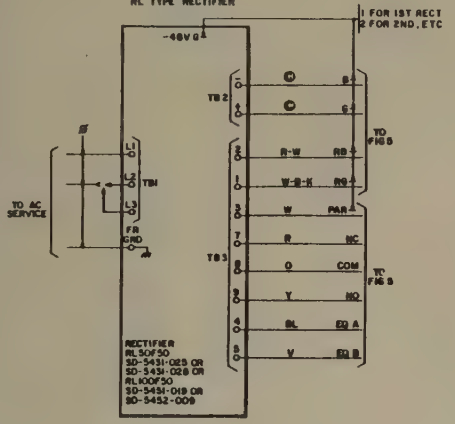


FIG 2
RHM TYPE RECTIFIER

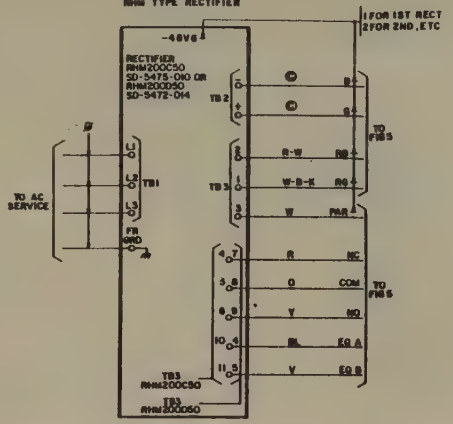


FIG 3
INVERTER

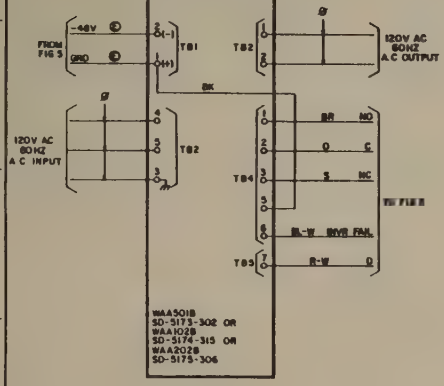


FIG 4
-48V BATTERY

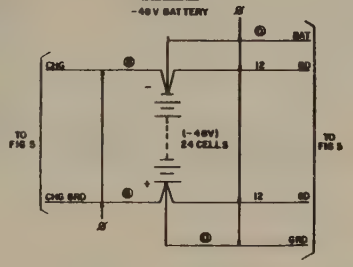
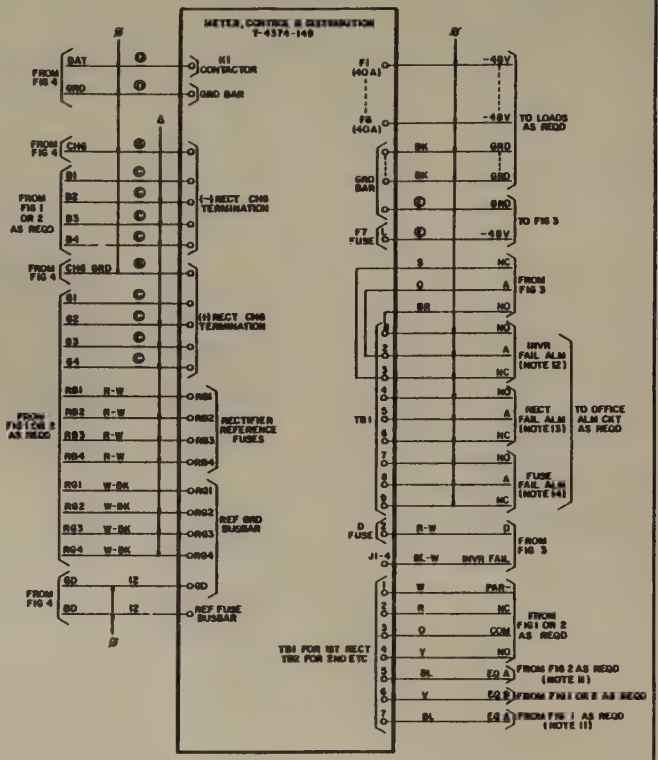
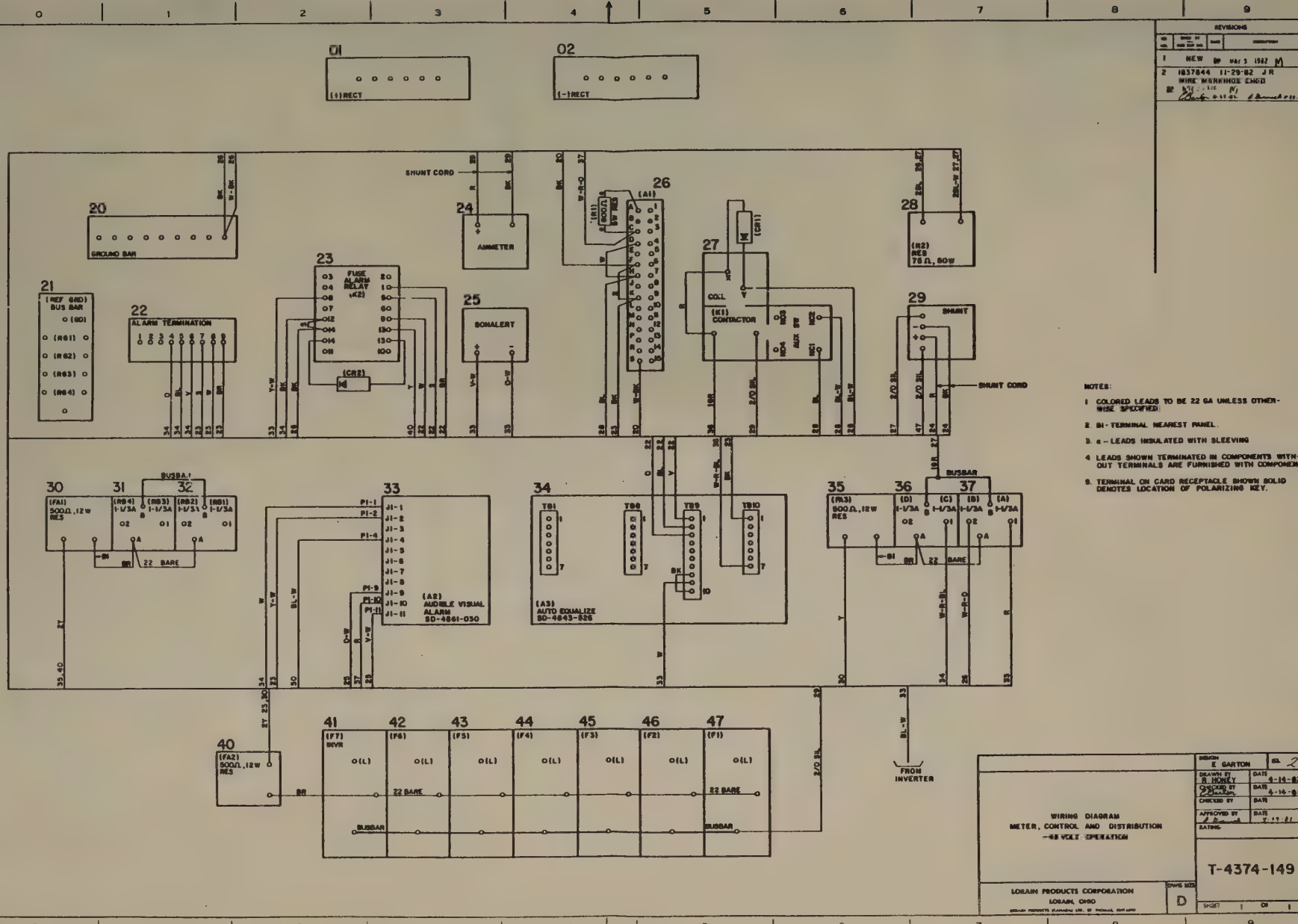


FIG 5
METER, CONTROL & DISTRIBUTION



MODEL 200CBX		T-5821-052
LORAIN PRODUCTS CORPORATION	DWG SIZE D	SHEET 2 OF 2 PRINTED IN U.S.A.

ISSUE 2



REVISIONS			
NO.	ZONE	DATE	DESCRIPTION
1			NEW BP MAR 3 1982 M
2			1837644 11-29-82 J R WIRE MARKINGS CHGD BY M.V. 12-6-82 M.J.

NOTES:

1. COLORED LEADS TO BE 22 GA UNLESS OTHERWISE SPECIFIED.
2. BI - TERMINAL NEAREST PANEL.
3. a - LEADS INSULATED WITH SLEEVING
4. LEADS SHOWN TERMINATED IN COMPONENTS WITHOUT TERMINALS ARE FURNISHED WITH COMPONENT
5. TERMINAL ON CARD RECEPTACLE SHOWN SOLID DENOTES LOCATION OF POLARIZING KEY.

WIRING DIAGRAM
METER, CONTROL AND DISTRIBUTION
-48 VOLT OPERATION

LORAIN PRODUCTS CORPORATION
LORAIN, OHIO

DRAWN BY R. HONEY 4-14-82
DESIGN E. GARTON
CHECKED BY 4-14-82
CHECKED BY
APPROVED BY 4-19-82
RATING

DWG SIZE D

T-4374-149

SHEET 1 OF 1

TABLE A

RECTIFIER SPECIFICATIONS

SEE FIG	SEE NOTE	MODEL SPEC	A.C. INPUT VOLTS	A.C. INPUT RECM FUSING AMPS	A.C. INPUT RECM WIRE SIZE	FRAME GRD RECM WIRE SIZE	D.C. OUTPUT VOLTS	D.C. OUTPUT AMPS	©	RECM OUTPUT LEAD SIZE FOR 10 VOLT LOOP DROP 12	10	8	6	4	2	1/0	2/0
IU	7	RJ6A50 5351-008	120	15	14	14	50	6	60'	97'	155'						
IA		L6A50 5351-006	120	15	14	14	50	6	60'	97'	155'						
IA		M6F50 5351-003	120	15	14	14	50	6	60'	97'	155'						
IV	5,6	RJ6F50 5351-009	240	(2) 15	14	14	50	6	60'	97	155'						
IA		L12A50 5371-013	120	15	14	14	50	12		49'	78'	124'					
IA		M12F50 5371-006	120	15	14	14	50	12		49'	78'	124'					
IU	7	RJ12A50 5371-016	240	(2) 15	14	14	50	12	30'	49'	78'	124'					
IV	5,6	RJ12F50 5371-017	240	(2) 15	14	14	50	12	30'	49'	78'	124'					
IA		M18F50 5371-006	120	30	10	10	50	18			52'	83'	132'				
IZ	6	RJ20F50 5371-020	240	20	12	12	50	20		29'	47'	75'	118'				
IB		M25F50 5411-033	120	30	10	10	50	25				60'	95'	150'			
IC		M25F50 5411-039	240	(2) 15	14	14	50	25				60'	95'	150'			
IW	4	RL30F5 5411-044	120	25	10	10	50	30				50'	79'	125'			
IT	5	RL30F50 5411-045	240	25 (2)15	10	10	50	30				50'	79'	125'			
IB		L30F50 5411-037	120	30	10	10	50	30				50'	79'	125'			
IB		M30F50 5411-025	240	(2) 15	14	14	50	30				50'	79'	125'			
IA	4	RL30F50 5411-043	240	40 (2)20	8	10	50	30				50'	79'	125'			
IB		M37F50 5411-026	240	25 (2)15	12	12	50	37					64'	102'	160'		
IT	5	RL50F50 5431-025	240	50 (2)25	6	8	50	50					47'	75'	120'		
IC		M40F50 5434-006	240	(2) 25	10	10	50	50					47'	75'	120'		
IE		M50F50 5434-006	240	(3) 15	14	14	50	50					47'	75'	120'		
IB		L50F50 5431-018	240	50 (2)25	6	8	50	53					47'	75'	120'		
IB		M50F50 5431-006	240	60 (2) 30	6	8	50	53					47'	75'	120'		
ID		M50D50 5434-001	240	(3) 15	14	14	50	50					47'	75'	120'		
IA	4	RL50F50 5431-023	240	35 (2)20	10	10	50	50					47'	75'	120'		
IW	4	RL30F50 5431-024	120 208 240	40 (2) 25 (2) 20	8 10 12	10 12	50	50					47'	75'	120'		
IF		M75D50 5444-003	240	(3) 25	10	10	50	75						80'	127'		
IB		M75F50 5441-001	120 240	100 (2) 50	2 6	8 10	50	75						80'	127'		
IC		HM100F50 5451-017	120 240	100 (2) 50	2 6	8 10	50	100						60'	95'	120'	
IE		HM100D50 5454-006	240	(3) 30	10	10	50	100						60'	95'	120'	
IB		L100F50 5452-004	120 240	100 (2) 50	2 6	8 10	50	100						60'	95'	120'	
IB		M100F50 5451-001	120 240	100 (2) 50	2 6	8 10	50	100						60'	95'	120'	
IF		M100D50 5454-003	240	(3) 35	8	10	50	100						60'	95'	120'	
IQ		F100D50	240	(3) 30	10	10	50	100						60'	95'	120'	
IS		KS20493L21 5451-010	240	50 DUAL ELEMENT	6	10	50	100						60	95'	120'	
IR	4	RL 100F50 5451-018	120 240	70 (2) 40	6 8	8 10	50	100						60'	95'	120'	
IJ	5	RHM400D50 5454-009	240	(3) 30	10	10	50	100						60'	95'	120'	
IJ		RHM100D50 5454-008	240	(3) 30	10	10	50	100						60'	95'	120'	
IT	5	RL100F50 5432 009	120 127 208 220-240	80 70 (2) 50 (2) 40	4 6 8	8	50	100						60'	95'	120'	
IJ	5	RHM400C50 5457-005	380 400 415	(3) 15	14	14	50	100						60'	95'	120'	
IR	4	RL100F50 5451-019	120 208 240	80 (2) 50 (2) 40	4 6 8	8 10	50	100						60'	95'	120'	
IT		RHM800D50 5454-010	240	(3) 30	8	10	50	100						60'	95'	120'	

TABLE A

RECTIFIER SPECIFICATIONS

SEE FIG	SEE NOTE	MODEL SPEC	A.C. INPUT VOLTS	A.C. INPUT RECM FUSING AMPS	A.C. INPUT RECM WIRE SIZE	FRAME GRD RECM WIRE SIZE	D.C. OUTPUT VOLTS	D.C. OUTPUT AMPS	©	RECM OUTPUT LEAD SIZE FOR 10 VOLT LOOP DROP 4/0	250 MCM	(2)250 MCM	600 MCM	(2)600 MCM	(4)600 MCM
IY		RHM2000D50 5472-014	240	(3) 60	6	10	50	200	95'	112'					
IE		HM2000D50 5472-009	240	(3) 50	8	10	50	200	95'	112'					
IE		HM200E50 5475-008	480	(3) 30	10	10	50	200	95'	112'					
IJ		RHM2000D50 5472-012	240	(3) 60	6	10	50	200	95'	112'					
IF		M2000D50 5472-003	240	(3) 60	8	10	50	200	95'	112'					
IJ	5	RHM2000D50 5472-013	240	(3) 60	6	10	50	200	95'	112'					
IQ		F2000D50 5471-001	240	(3) 80	6	10	50	200	95'	112'					
IJ	5	RHM2000C50 5475-010	380 400 415	(3) 30	10	10	50	200	95'	112					
IJ		RHM400D50 5481-029	240	(3) 125	2	6	50	400					135'		
IJ	5	RHM400D50 5481-034	240	(3) 125	2	6	50	400					135'		
IH		HM400D50 5481-018	240	(3) 100	2	8	50	400					135'		
IH		HM400E50 5482-007	480	(3) 50	6	10	50	400					135'		
IJ	5	RHM400D50 5482-017	380 400 415	(3) 60	6	10	50	400					135'		
IK		M400D50 5481-009	240	(3) 100	2	8	50	400				112'			
IY		RHM2000D50 5481-036	240	(3) 100	2	8	50	400					135'		
IQ		F400D50 5481-004	240	(3) 100	2	8	50	400				112'			
IX		RL400D50 5481-035	240	(3) 100	2	8	50	400				112'	135'		
IH		HM800D50 5484-019	240	(3) 200	4/0	6	50	800						134'	
IH		HM800E50 5485-013	480	(3) 100	2	8	50	800						134'	
IJ		RHM800D50 5484-030	240	(3) 225	4/0	3	50	800						134'	
IL		M800D50 5484-008	240	(3) 200	4/0	6	50	800						134'	
IP		M800E50 5485-006	480	(3) 100	2	8	50	800						134'	
IM		HM1600D50 5487-008	240	(3) 400	500 MCM	3	50	1600							134'
IN		HM1600E50 5487-207	480	(3) 200	4/0	6	50	1600							134'

NOTES

1. RECTIFIER TERMINATIONS SHOWN ARE FOR USE WITH STANDARD POWER BOARD FEATURES. FOR OTHER AVAILABLE FUNCTIONS NOT SHOWN SEE RECTIFIER POWER DATA SHEET AND PROVIDE AS REQUIRED.
2. ALL COLORED LEADS TO BE 18GA UNLESS OTHERWISE SPECIFIED
3. WIRE SIZES MEET THOSE RECOMMENDED IN NATIONAL ELECTRIC CODE TABLE FOR NOT MORE THAN THREE COPPER CONDUCTORS IN RACEWAY FOR 75°C CONDUCTOR TEMP.
4. FOR THESE MODELS, 120 VOLT AC SERVICE IS CONNECTED TO T&B 1, TERMS L1 & L3; OR 208/240 VOLT TO L1 & L2
5. 50/60 HZ MODEL
6. FOR THESE MODELS, 120 VOLT A.C. SERVICE IS CONNECTED TO T&B 3, TERMS 1 & 3; OR 208/240 VOLT TO 1 & 2.
7. MODEL EQUIPPED WITH A.C. INPUT CORD

REVISIONS			
1			
2	1836620	8-3-78	DAC
TYNEW MODELS, NOTE 3 ADDED			
3	1836929	9-21-79	J.R
NEW MODELS, NOTES 6 & 7 ADDED			

POWER SYSTEMS

48 VOLT RECTIFIER CONNECTIONS & SPECIFICATIONS FOR USE WITH STANDARD POWER BOARD MODELS

LORAIN PRODUCTS CORPORATION
LORAIN, OHIO

DESIGN		NO 3
DRAWN BY	DATE	
CHECKED BY	DATE	
APPROVED BY	DATE	
APPROVED BY	DATE	
RATING	STANDARD	
DWG NO	0311-916	
SIZE	D	
SHEET	1 OF 5	

FIG 1A
RECTIFIER

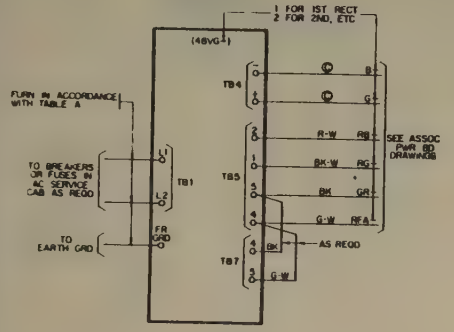


FIG 1B
RECTIFIER

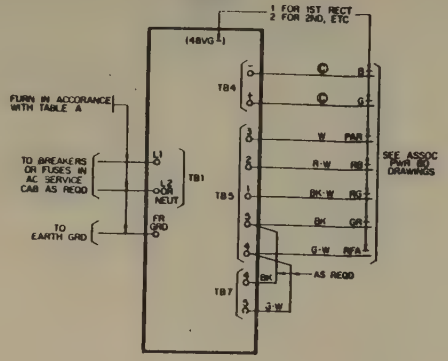


FIG 1C
RECTIFIER

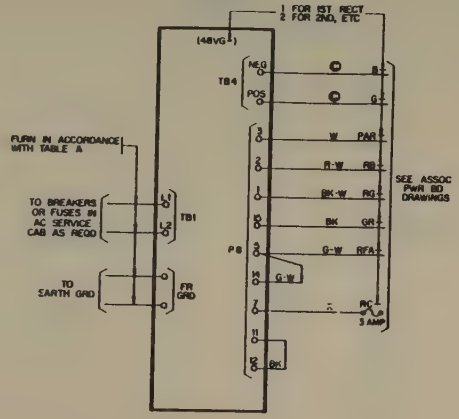


FIG 1D
RECTIFIER

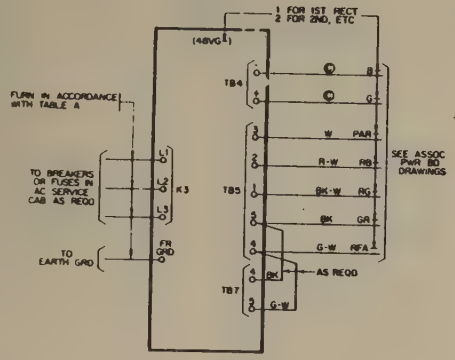


FIG 1E
RECTIFIER

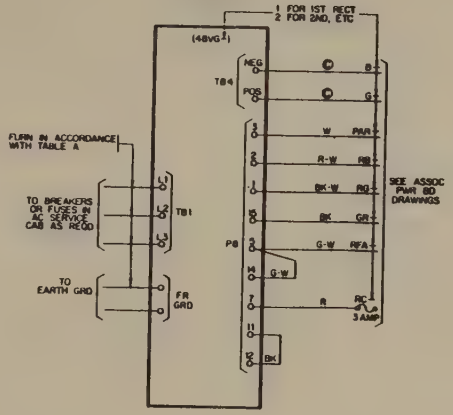
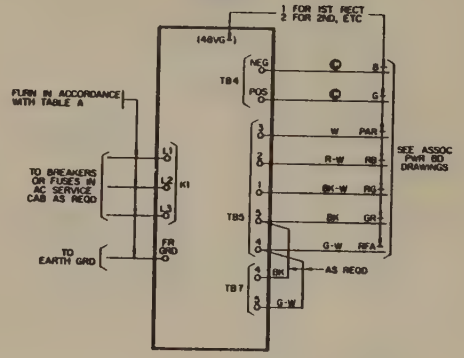


FIG 1F
RECTIFIER



48 VOLT RECTIFIER WIRING	0311-916
LORAIN PRODUCTS CORPORATION SIZE D	SHEET 2
PRINTED IN U.S.A.	

ISSUE 3

FIG 1H

RECTIFIER

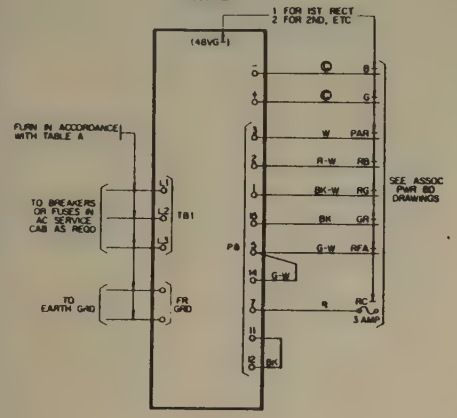


FIG 1J

RECTIFIER

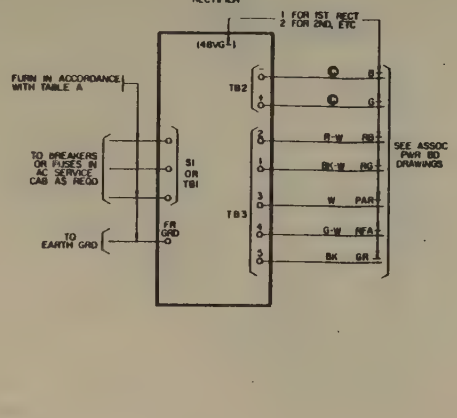


FIG 1K

RECTIFIER

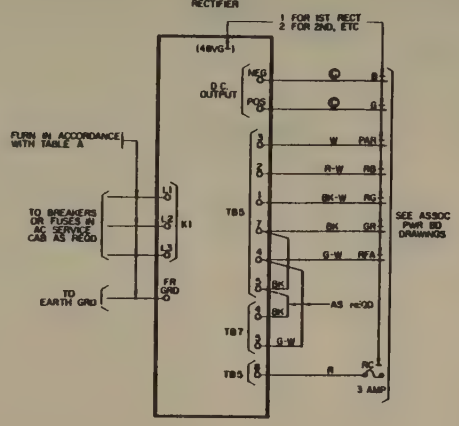


FIG 1L

RECTIFIER

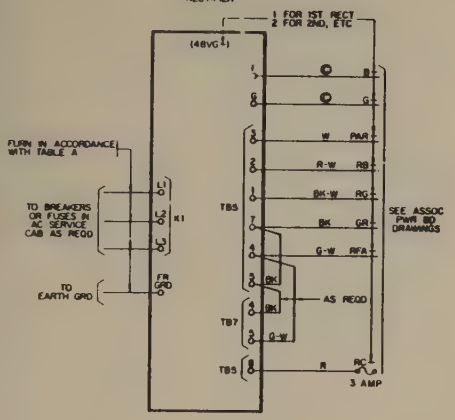


FIG 1M

RECTIFIER

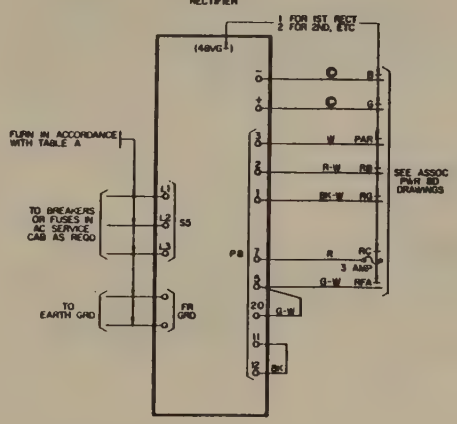
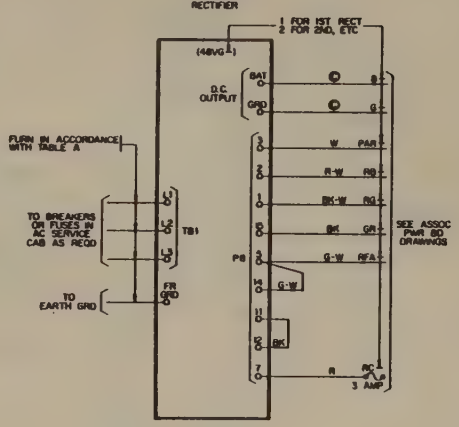


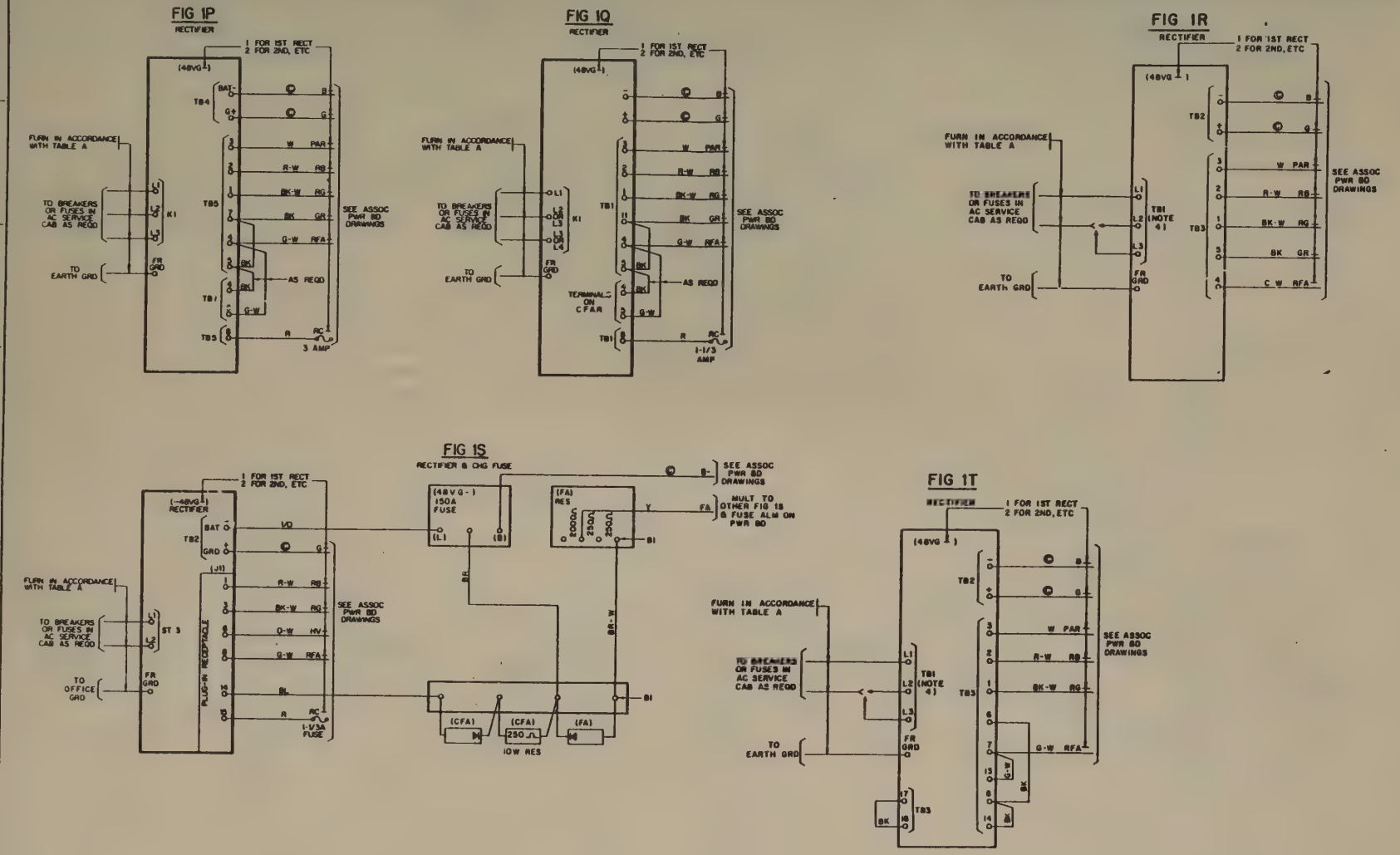
FIG 1N

RECTIFIER



48 VOLT RECTIFIER WIRING	0311-916
LORAIN PRODUCTS CORPORATION DWG REV D	SHEET 3
	PRINTED IN U.S.A.

3



48 VOLT RECTIFIER WIRING	0311-916
LORAIN PRODUCTS CORPORATION	SHEET 4
DWG SIZE D	PRINTED IN U.S.A.

FIG IU
RECTIFIER

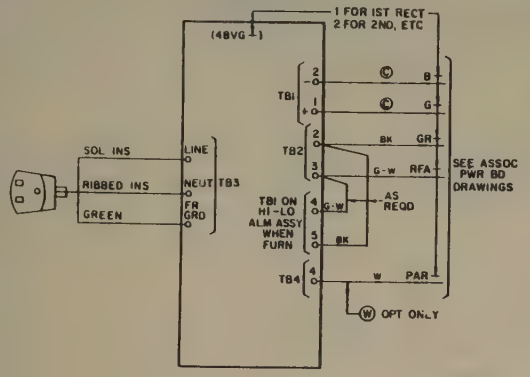


FIG IV
RECTIFIER

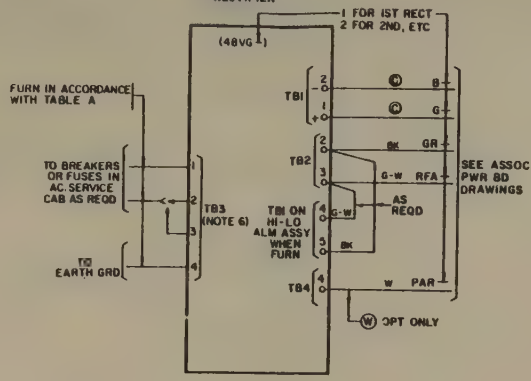


FIG IW
RECTIFIER

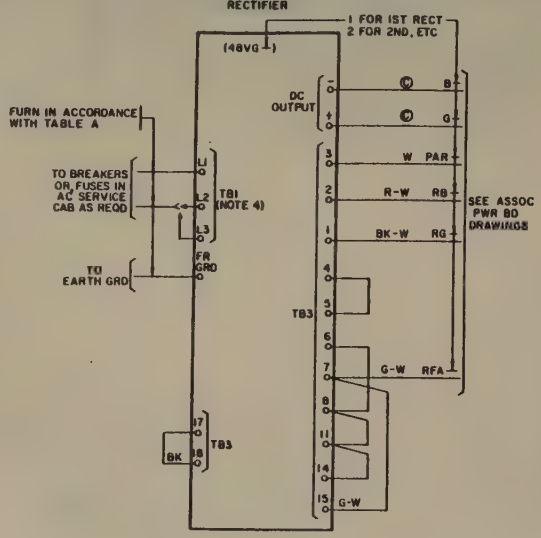


FIG. IX
RECTIFIER

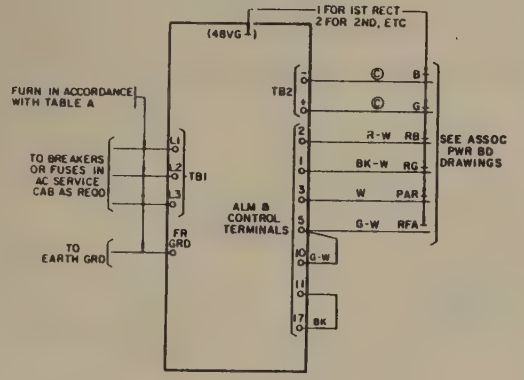


FIG IY
RECTIFIER

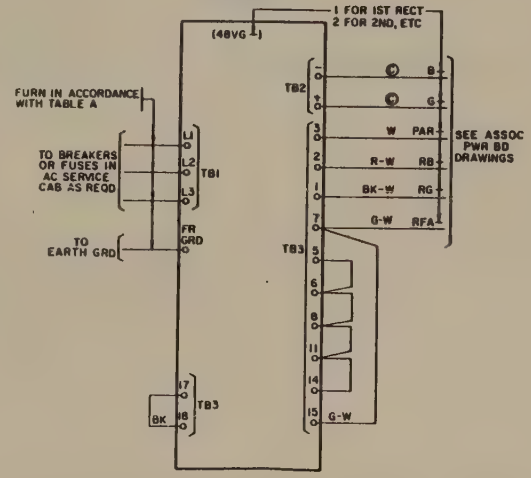
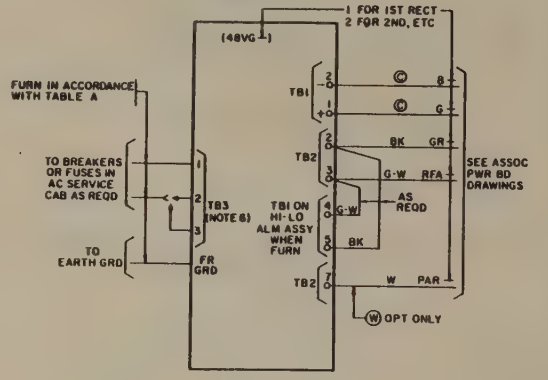


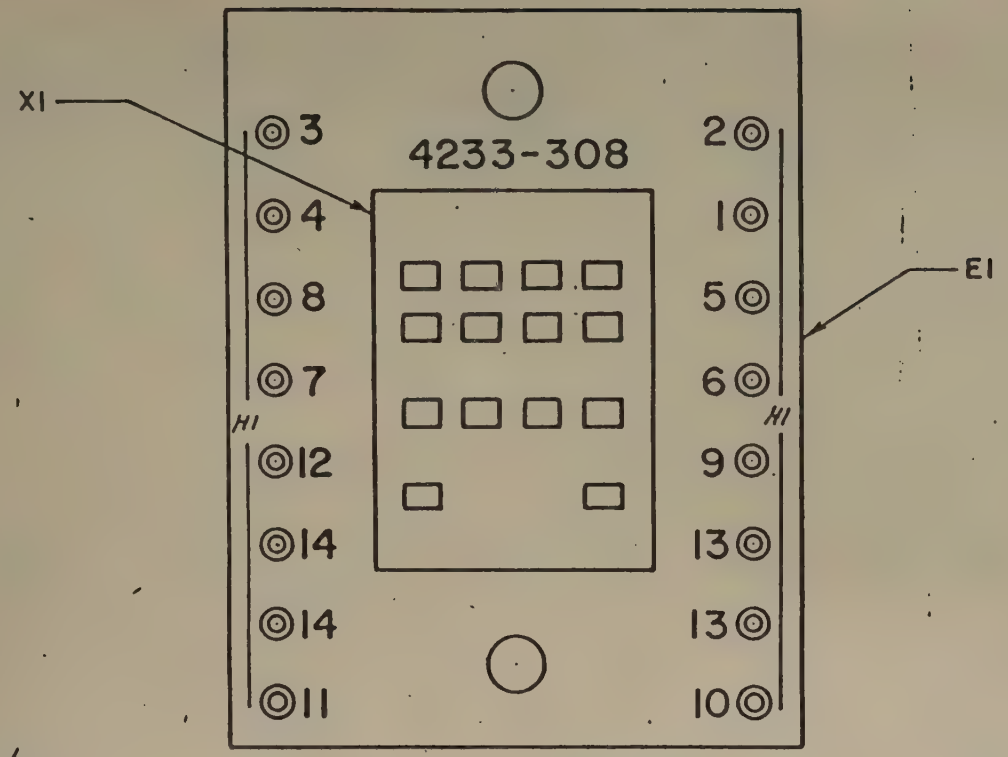
FIG IZ
RECTIFIER



48 VOLT RECTIFIER WIRING	0311-916
LORAIN PRODUCTS CORPORATION D	SHEET 3

3

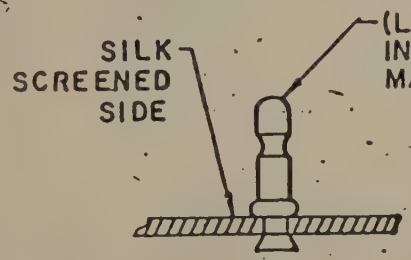
FIG. 1



Note
1. THIS ASSEMBLY TO BE BUILT ON P.C. BOARD 3153-045

FIG. 2

TERMINAL INSTALLATION



FIRST USED ON MODEL PDR153B

ISS NO.	CHGD BY / CHG SLIP NO.	DATE	REVISION
1	M		NEW
2	1831975 R. Jones Ch A Mucka 7-13-72		7 ADDITIONAL 12M COIL TERMS. 72 ADDED A.J. Jubelli 7-17-72
3	M 1836461		TERMINALS ADDED W. Blick 5/17/77

FIRST USED ON	MODEL	
	NEXT ASSY	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCE ON
FRACTIONS ±1/32 DECIMALS ±0.031 ANGLES ±1.0°

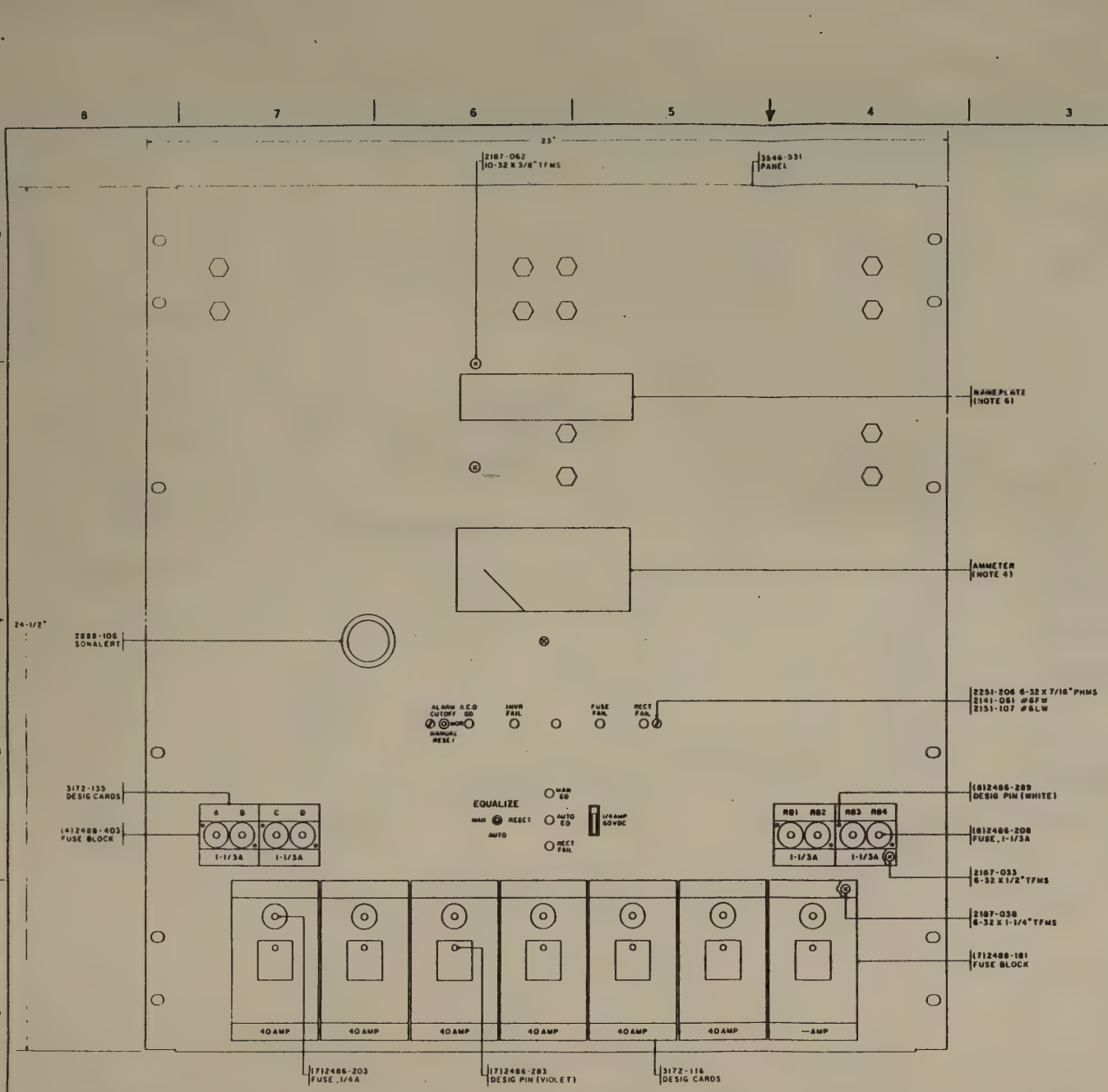
SIZE A

ASSEMBLY DRAWING
FOR
RELAY BOARD

LORAIN Products Corporation
LORAIN, OHIO
LORAIN PRODUCTS (CANADA) LTD.
ST. THOMAS, ONTARIO

DRAWN BY	DATE	SCALE 2/1
J. PARKER	1-7-69	
DESIGNED BY T. BAILEY	DATE 11-8-68	DO NOT SCALE
CHECKED BY A Mucka	DATE 1-10-69	4233-308
APPROVED BY A.J.J.	DATE 1-10-69	

LP-328-R1



NOTES:

1. STAMP ASSEMBLY NUMBER AND ISSUE NUMBER IN 3/16" BLACK CHARATERS
2. ALL STAMPING TO BE 3/16" BLACK CHARACTERS UNLESS OTHERWISE SPECIFIED
3. DESIGNATIONS IN ( ) ARE SHOWN FOR REFERENCE ONLY
4. AMMETER AND SHUNT ARE FURNISHED WITH POWER BOARD ACCORDING TO CAPACITY REQUIRED
5. CONNECT WIRE HARNESS 4946-011 PER T-4374-149
6. NAMEPLATE IS FURNISHED WITH POWER BOARD AND TO BE MOUNTED ON THIS ASSEMBLY AS SHOWN.
7. DOTTED LUGS ARE FURNISHED WITH POWER BOARD ACCORDING TO CAPACITY OF PLANT AS SHOWN BELOW:
   LIST 1 AND 2 - 6-4/0 (2456-338)
   LIST 3 AND 4 - 1/0-500MCM (2456-346)

REVISIONS

9	NEW	JP	MAY 3

FIRST USED ON	HEAT ASSY	5821-032
	MODEL NO	200CBX

LORAIN PRODUCTS CORPORATION
LORAIN, OHIO
A Subsidiary of Advance Electric Co.

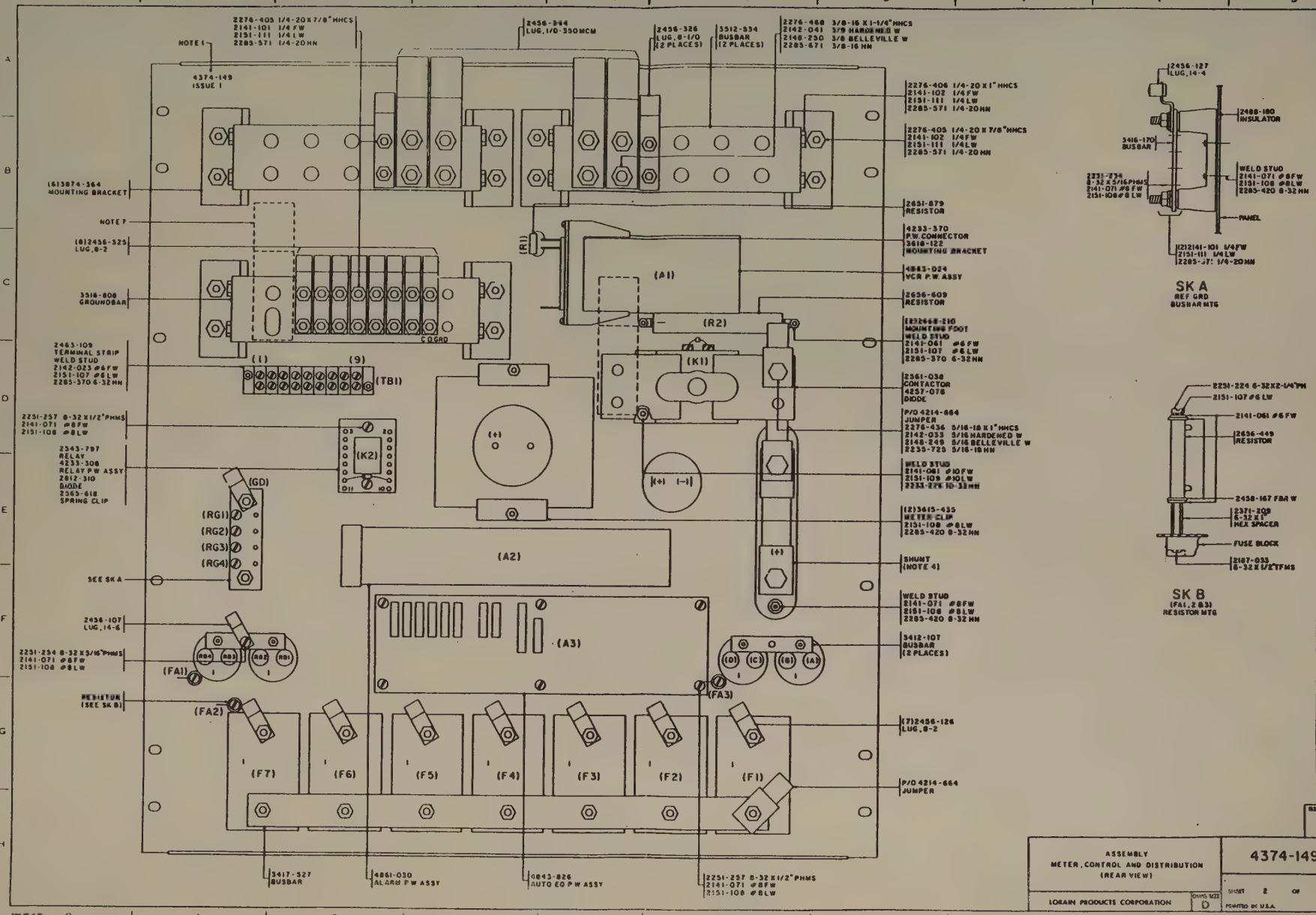
ASSEMBLY,
METER, CONTROL AND DISTRIBUTIO
(24-1/2" X 23" R.R.MTG.)

DRAWN	F GARTON
TRACED	R HONEY
CHECKED	
APPROVED	

DO NOT SCALE DWG

4374-149

SHEET 1 OF 2



ASSEMBLY
METER, CONTROL AND DISTRIBUTION
(REAR VIEW)

4374-149

LORAIN PRODUCTS CORPORATION

DWG SIZE D

SHEET 2 OF 2

PRINTED IN U.S.A.

REVISIONS

1

FOR PARTS OR SERVICE, CONTACT THE NEAREST

LORAIN REGIONAL SERVICE CENTER

OHIO REGIONAL SERVICE CENTER
1313 G Street
Lorain, Ohio 44052
Telephone: 216/288-1122

TEXAS REGIONAL SERVICE CENTER
722 N. Great Southwest Parkway
Arlington, Texas 76011
Telephone: 817/640-1134

CONNECTICUT REGIONAL SERVICE CENTER
38 Prospect Hill Road (P.O. Box 111)
East Windsor, Connecticut 06088
Telephone: 203/627-9378

SOUTHERN CALIFORNIA REGIONAL SERVICE CENTER
3001 Red Hill, Bldg. 4, Suite 119
Costa Mesa, California 92626
Telephone: 714/540-4395

ILLINOIS REGIONAL SERVICE CENTER
245 Roosevelt Road, Bldg. 2, Unit 13
West Chicago, Illinois 60185
Telephone: 312/231-5775

NORTHERN CALIFORNIA REGIONAL SERVICE CENTER
473 Sapena, Bldg. 2, Suite 18
Santa Clara, California 95050
Telephone: 408/988-1078

GEORGIA REGIONAL SERVICE CENTER
6270 McDonough Drive, Suite C
Norcross, Georgia 30093
Telephone: 404/449-0840

CANADIAN SERVICE CENTER
122 Edward Street
St. Thomas, Ontario
Telephone: 519/631-0780

LORAIN SERVICE CAN ALSO PROVIDE:

Audio Visual Training Programs (Slide/Cassette)
- Battery Charger Maintenance - No. L302AV
- Storage Battery Maintenance - No. L301AV
- Central Office Ground Maintenance - No. L401AV

Factory or On-Site Training School

Specialized Test Equipment
- Ringing Generator Test Set - Model LS2000
  (Includes loads, metering, digital frequency counter)
  Ringing Demand Test Set - Model LS5000
  (measures ring load current and voltage)
- 130V Converter Test Load - Model LS1000
  (Variable loads to 6 amps)

Power Evaluation Program (PEP)

- Power Analysis program for all central office power equipment including batteries.

Power Upgrade and Modernization Services

- Including engineering, fabrication and complete installation

Maintenance Contracts

Spare Parts Kits and Fuse Kits
Handy and Practical, helps keep down time to a minimum.

Please send me more information on the following:

Return to: LORAIN SERVICE
1122 F Street
Lorain, Ohio 44052

_____ Audio Visual Training Programs

_____ Factory or On-Site Training

_____ Model LS5000 Test Set

_____ Model LS2000 Test Set

_____ Model LS1000 Test Set

_____ Power Evaluation Program (PEP)

_____ Power Upgrade and Modernization Services (EF & I)

_____ Maintenance Contracts

_____ Spare Parts Kits and Fuse Kits

COMPANY NAME: _____

ADDRESS _____

CITY, STATE, ZIP _____

ATTN: _____ TITLE: _____

TEL. NO. _____